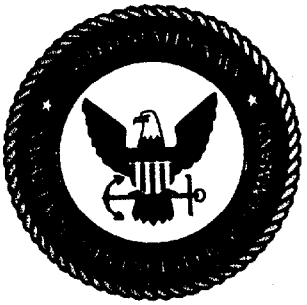
Final
Engineering Evaluation / Cost Analysis (EE/CA)
for
SWMU 8, West Annex Sandblast Area Naval Amphibious Base Little Creek, Virginia Beach, Virginia



Prepared for

Department of the Navy
Atlantic Division
Naval Facilities Engineering Command
Norfolk, Virginia

Contract No. N62470-95-D-6007
CTO-0159

September 2000

Prepared by

CH2MHILL

Baker
Environmental, Inc.

CDM
Federal Programs Corp.

Signature Page

Final

Engineering Evaluation/Cost Analysis (EE/CA)

For

SMMU 8, West Annex Sandblast Area

Naval Amphibious Base Little Creek,

Virginia Beach, Virginia

Navy CLEAN II Program

Contract Number N62470-95-D-6007

CTO-0159

Prepared by

CH2M HILL

September 2000

Approved by: _____ Date: 9/11/2000

Stewart Barnes, P.E.

Senior Technical Reviewer

Approved by: Donna Caldwell Date: 9/11/00

Donna Caldwell, P.G.

Project Manager

Approved by: Donna Caldwell Date: 9/11/00

For Scott MacEwen, P.E.

Activity Manager

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Acronym List

ABM	abrasive blast material
ARAR	Applicable or Relevant and Appropriate Requirement
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DOD	Department of Defense
DRE	destruction and removal efficiency
EE/CA	Engineering Evaluation/Cost Analysis
IR	Installation Restoration
MCL	maximum contaminant level
MSL	mean sea level
NAB	Naval Amphibious Base
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NTCRA	Non-Time-Critical Removal Action
O&M	operation and maintenance
RAB	Restoration Advisory Board
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act of 1986
SI	Site Investigation
TAL	Target Analyte List
TCL	Target Compound List
TCLP	toxicity characteristic leaching procedure
TPH	Total Petroleum Hydrocarbon
TSD	treatment, storage, and disposal
USEPA	United States Environmental Protection Agency
VDEQ	Virginia Department of Environmental Quality

Executive Summary

This report presents an engineering evaluation and cost analysis (EE/CA) for a non-time-critical removal action of abrasive blast material (ABM) at the SWMU 8, the West Annex Sandblast Area at the Naval Amphibious Base (NAB) Little Creek in Virginia Beach, Virginia. SWMU 8 is located near Gate 1 and the intersection of Midway and Amphibious Drive. The West Annex Sandblast Area is an area of land formerly used for sandblast activity and the temporary storage of abrasive blast material (ABM) prior to off-site disposal.

CH2M HILL conducted a preliminary site investigation at SWMU 8 in March 2000 to delineate the horizontal and vertical extent of the ABM in the area where blast material is visibly present at the ground surface. Three grab samples of ABM were collected for analysis of toxicity characteristic leaching procedure (TCLP) and target compound list metals for disposal characterization. The results of the preliminary site investigation indicated that there is approximately1,800 cubic yards of ABM and ABM-soil mixture present in the northwestern portion of SWMU 8 near Water Tower 1553. Analytical results indicate that the three samples collected contain lead at concentrations ranging from 1070 mg/kg to 1820 mg/kg. This exceeds the US EPA Region II Guidance of 400 mg/kg for lead in soils in residential areas and the 1000 mg/kg criteria for lead in industrial areas. Only one out of the three samples (LW08-01; 5.42 mg/L) exceeded the TCLP criteria of 5 mg/L for lead. A Site Investigation was initiated in May 2000 to more fully characterize soil and groundwater at SWMU 8.

The purpose of the non-time-critical removal action (NTCRA) is to eliminate potential risks to human health and the environment through the removal of the ABM. The scope of this removal action will be to remove the ABM or material exceeding EPA Region II Residential RBCs in areas of visible blast material at the surface near Water Tower 1553, and will involve excavation of approximately 1,800 cubic yards of ABM.

The EE/CA examined three potentially acceptable alternatives for removal. These alternatives were excavation of visible ABM and disposal as a non-hazardous waste in a local landfill, or, if a portion of the waste is hazardous, in a landfill permitted to accept these wastes (Alternative 1), excavation and removal of ABM and lead-contaminated soil to a cleanup level equal to the residential screening level of 400 mg/kg (Alternative 2), and excavation and removal of ABM and lead-contaminated soil to a cleanup level equal to the industrial screening level of 1000 mg/kg (Alternative 3).

All of these options are highly effective in meeting the removal action objectives, with the main difference being the likelihood of future remedial action being required to address residual soil contamination. This likelihood would be high for Alternative 1, moderate for Alternative 3, and low for Alternative 2. Future remedial action could range from further removal to land-use controls.

All of these alternatives are relatively easy to implement because they are common activities performed by environmental contractors. There is a potentially large disparity in the cost of

each option, which is related to the estimated quantity of ABM and soil to be excavated and disposed. Alternative 2, excavation, transport, and disposal of ABM to meet residential criteria, is recommended based upon surface and subsurface analytical data demonstrating that this criteria may be readily achieved and to minimize restrictions on land use at the site once the removal action has been completed.

SECTION 1

Introduction

This report presents an Engineering Evaluation/Cost Analysis (EE/CA) for a non-time-critical removal action (NTCRA) for SWMU 8 West Annex Sandblast Area at the Naval Amphibious Base (NAB) Little Creek, Virginia Beach, Virginia. The EE/CA is prepared under the Naval Facilities Engineering Command (NAVFACENGCOM) LANTDIV Navy Contract N62470-95-D-6007, Navy Comprehensive Long-Term Environmental Action Navy (CLEAN), District III, Contract Task Order–0159.

Previous site inspections have identified SWMU 8 as requiring environmental consideration due to the existence of exposed abrasive blast material (ABM). ABM consists of sandblast grit and paint chips derived from sand blast activities from the removal of paint from ships and equipment. SWMU 8 includes a vacant lot located near the intersection of Midway Road and Amphibious Drive that was previously used for sandblasting activities and spent ABM storage. A general site map for SWMU 8 is provided in Figure 1-1. A detail showing the SWMU 8 West Annex Sandblast Area and the extent of blast grit as previously delineated is provided in Figure 1-2.

The following information is presented within the EE/CA for SWMU 8:

- Site description and analytical data
- Identification of the removal action objectives
- Identification of removal action alternatives and technologies
- Recommendation of a preferred removal alternative
- Schedule for the selected removal alternative

1.1 Regulatory Background

This document is issued by the U.S. Department of the Navy, lead agency responsible for remediation of SWMU 8, with the assistance of the United States Environmental Protection Agency (US EPA) Region III and the Virginia Department of Environmental Quality (VDEQ), under Section 104 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA).

Section 104 of CERCLA and SARA allows an authorized agency to remove, or arrange for removal, and to provide for remedial action relating to hazardous substance, pollutants, or contaminants at any time, or to take any other response measures consistent with the National Oil and Hazardous Substance Pollution Contingency Plan (NCP) as deemed necessary to protect public health or welfare and the environment.

The NCP, 40 Code of Federal Regulations (CFR) 300, provides regulations for implementing CERCLA and SARA, and regulations specific to removal actions. The NCP defines a removal action as the "cleanup or removal of released hazardous substances from the environment, such actions as may be necessary to monitor, assess, and evaluate the threat of

release of hazardous substances, the disposal of removed material, or the taking of such other actions as may be necessary to prevent, minimize, or mitigate damage to the public health or welfare or to the environment, which may otherwise result from a release or threat of release." The removal action being considered for the portion of SWMU 8 where ABM is based upon preliminary test results of ABM and ABM/soil demonstrating relatively low concentrations of lead to be removed. These levels will make residential criteria relatively easy to achieve with the removal action. This removal action is not time-critical. NTCRAs are defined in 40 CFR Section 300.415(b)(4) as actions pertaining to a less imminent threat to human health and the environment and that have planning periods of 6 months or more. For time-critical removal actions, actions shall begin as soon as possible to "abate, prevent, minimize, stabilize, mitigate, or eliminate the threat to public health or welfare of the United States or the environment" (40 CFR Section 300.415(b)(3)).

The 40 CFR Section 300.415 requires the lead agency to conduct an EE/CA when a NTCRA is planned for a site. The goals of an EE/CA are to identify the objectives of the removal action and to analyze the effectiveness, implementability, and cost of various alternatives that may satisfy these objectives. An EE/CA documents the removal action alternatives and selection process. Where the extent of the contamination is well defined and limited in extent, NTCRAs also allow for the expedited cleanup of sites in comparison to the remedial action process under CERCLA.

Community involvement requirements for non-time-critical removals include preparing and approving an EE/CA, and making it available for public review and comment for a period of 30days. An announcement of the 30-day public comment period on the EE/CA is required in a local newspaper. Written responses to significant comments must be prepared and included in the Administrative Record.

1.2 Purpose and Objectives

Submittal of this document fulfills the requirements for non-time-critical actions defined by CERCLA, SARA, and the NCP. This EE/CA has been prepared in accordance with USEPA's guidance document *Superfund, Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA*, PB93-963402, January 1993.

The EE/CA compares three removal alternatives based on their technical feasibility, ability to protect human health and the environment, ability to prevent the potential release of hazardous constituents, and cost. Individual goals of this EE/CA are to: (1) provide a framework for evaluating and selecting alternative technologies, (2) compile analytical results, (3) satisfy administrative record requirements for documenting the removal action selection, and (4) satisfy environmental review and public information requirements for removal actions. .

The objective of this removal action is to reduce the extent of abrasive blast material in the vicinity of Water Tower 1553 and minimize, to the extent practical, the human health and environmental risk posed by potential lead-contaminated soil. At the conclusion of the removal action, confirmatory sampling of the remaining soil in this portion of SWMU 8 will be conducted. The purpose of the confirmation sampling will be to confirm the removal action goals were complete. The data collected during the confirmation sampling will

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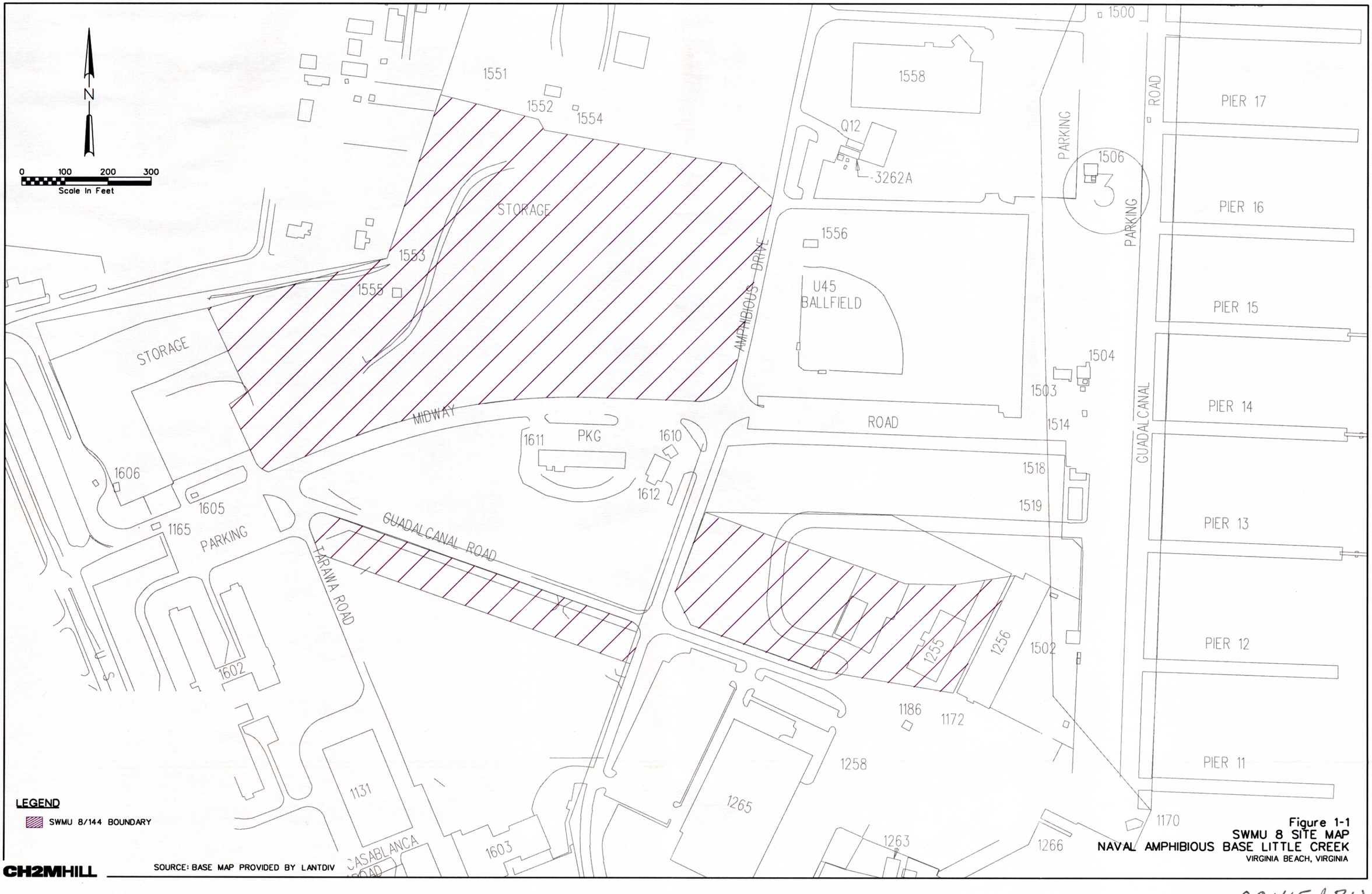

LEGEND

SWMU 8/144 BOUNDARY

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SOURCE: BASE MAP PROVIDED BY LANTDIV

Figure 1-1
SWMU 8 SITE MAP
NAVAL AMPHIBIOUS BASE LITTLE CREEK
VIRGINIA BEACH, VIRGINIA

00415ABLY

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N

0 50 100 150
Scale In Feet

LEGEND

- ● HAND AUGER BORING LOCATION
- ↓ SHOVEL LOCATION USED TO IDENTIFY EXTENT OF GRIT
- ⬭ APPROXIMATE EXTENT OF BARE GROUND/GRIT AT SURFACE
- 6 THICKNESS OF BLAST GRIT OR BLAST GRIT/SOIL MIXTURE (LW08-01 THROUGH LW08-36) (INCHES FROM GROUND SURFACE)
- SG BLAST GRIT AT GROUND SURFACE ONLY
- ND BLAST GRIT NOT DETECTED
- LW08-01-SS-00 SURFACE BLAST GRIT SAMPLE

SURFACE GRIT ONLY 0-5%

SURFACE GRIT ONLY 5-10%

100% GRIT TOP 1" 30% GRIT TO 4"; SOME 60%

LW08-01-SS-00

LW08-02-SS-00

LW08-03-SS-00

DRAINAGE DITCH

STORMDRAIN

SIDEWALK

STORAGE

PARKING

GATE 1

1165

1555

1622

1611

PKG

MIDWAY

Figure 1-2
SWMU 8 WEST ANNEX SANDBLAST AREA
EXTENT OF BLAST GRIT
(MARCH 15, 2000 SITE RECONNAISSANCE)
NAB LITTLE CREEK
VIRGINIA BEACH, VIRGINIA

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SECTION 2

Site Characterization

2.1 Site Description and Background

Between 1949 and 1971, sandblasting and residue storage occurred in areas north of Midway Road, south of Guadalcanal Road, and west of Amphibious Drive. These areas have been identified as SWMU 8 (Figure 1-1). As boats were hauled into the area for sandblasting, residue accumulated on the ground. An estimated 5,125 cubic yards of residue were stored in the area between 1949 and 1954, and an additional 3,525 cubic yards were stored between 1954 and 1971. Sand blast material was temporarily stored at SWMU 8 prior to off site disposal. A reconnaissance of the area in 1999 noted ABM at the ground surface in the area surrounding Water Tower 1553.

During a site reconnaissance in January 2000 in the area where blast material is exposed at the surface, three surface grab samples of pure ABM were collected for characterization analysis. These samples are identified as LW08-01-SS-00, LW08-02-SS-00, and LW08-03-SS-00. Sample LW08-01-SS-00 was collected underneath Water Tower 1553, sample LW08-02-SS-00 was collected in the central part of the site where ABM is exposed, and sample LW08-03-SS-00 was collected in the non-grassy area where ABM is exposed near Midway Road in the vicinity of a storm drain (Figure 1-2). Each surface grab sample of ABM was collected from 0 to 4 inches and was biased for the presence of paint chips to obtain a "worst case" characterization of the ABM. All three samples were immediately placed on ice for preservation and transportation to the laboratory for analysis of full Toxicity Characteristic Leaching Procedure (TCLP), target analyte list (TAL) metals, pesticides, and polynuclear aromatic hydrocarbons (PAHs).

On March 15, 2000 a preliminary field investigation was conducted at SWMU 8 West Annex Sandblast Area to delineate the extent of ABM in areas where blast material is visibly present at the ground surface. Shallow 1-foot-deep borings were constructed using a hand auger, and in some areas a shovel, to expose the shallow subsurface soil. The borings were logged for the presence/absence of ABM and for lithology of the surface soil material. Each location was marked with a pin flag and labeled with boring identification number. Borings were identified as LW08-01 through LW08-36. In the vicinity of Water Tower 1553, along the northern boundary fence line, and in non-grassy areas northeast of the water tower, a shovel was used to expose surface soil in numerous locations, which were not individually labeled but are identified on the site map (Figure 1-2).

All hand auger and shovel sampling points were located using a tape measure and/or by pacing distances to known structures such as roadways, parking areas, and power poles. None of the locations were surveyed and all locations should be considered approximate.

The presence/absence of ABM in each boring was identified visually. An estimate of the percentage of soil to blast grit was made where appropriate. The thickness of ABM or ABM/soil mixtures was determined using a measuring tape.

2.2 Previous Removal Actions at the Site

The United States Navy, lead agency responsible for NAB Little Creek, has no documentation of any previous removal actions taking place at SWMU 8, other than transport of piles of spent blast grit.

2.3 Source, Nature, and Extent of Contamination

The extent and nature of abrasive blast material at SWMU 8 is based on samples collected during a January 2000 site reconnaissance and a preliminary site investigation in March 2000. Boring locations from the field investigation are shown on Figure 1-2, and a summary of boring data is presented in Table 2-1.

2.3.1 Extent of Blast Grit

Findings of the field investigation at SWMU 8 indicate that blast grit at the site is generally limited to the upper six inches in the soil profile, and in most areas is limited to the upper four inches. The maximum depth of blast grit was 10 inches noted in boring LW08-19 located near the southern boundary of the area along Midway Road. Borings adjacent to LW08-19 indicate this thickness is limited to a very small (50 square foot area or less) area. In two of the borings (LW08-29 and LW08-21), trace quantities of blast grit was noted to a depth of 12 inches.

Areas of 100 percent blast grit are limited to the ground surface and upper two inches or less near Water Tower 1553, and in small areas of bare ground southwest of the water tower including the southern boundary near Midway Road. Northeast of Water Tower 1553 two areas with sparse to no grass cover are present. Blast grit in these areas is present only at the ground surface and with only minor surface coverage of about 10 to 20 percent. The remainder of SWMU 8 north of Midway Road consists of grassy / gravel ground cover. With the exception of two small grass/gravel covered areas, no blast grit was observed at the surface or in the shallow subsurface in the remaining portions of SWMU 8 north of Midway Road. The two exceptions are a small grassy/gravel area west of the water tower and a small area adjacent to the parking lot southeast of the water tower (area noted by "SG" in Figure 1-2). Blast grit is only present at the ground surface in these areas with about 30 to 50 percent ABM covering the surface. Excavations using a shovel were made along the grassy northern boundary of the site adjacent to the fence line and residential area. No blast grit was encountered along the property boundary.

Throughout most of the site, blast grit is mixed with dark to medium brown, fine to medium grained sand. A fine to medium grained, light brown and tan, well sorted sand with no blast grit was encountered in nearly all borings at depths between five and 10 inches. All borings were terminated at a depth less than 12 inches below ground surface.

TABLE 2.1
NAB Little Creek
SWMU 8 West Annex Sandblast Area
Summary of Boring Data

Boring Location	Boring Depth (inches)	Grit Top (inches)	Grit Bottom (inches)	Soil Top (inches)	Soil Botom (inches)	Grit Description	Soil Description	Comments
LW08-01	6	0	4	4	6	100% grit to 1"; 30 to 60 % grit to 4"	medium brown silty sand, dry - sand,	Sample collected January 00 TCLP/TAL/PAH
LW08-02	10	0	6.5	6.5	10	0-4" soil/grit 50%; 4-6.5" 100% blast grit	light brown, fine to medium grained, well sorted sand	Sample collected January 00 TCLP/TAL/PAH
LW08-03	12	0	7	7	12	80-100% grit mixed w/soil	very pale brown sand, dry, well sorted, fine grained, loose	Sample collected January 00 TCLP/TAL/PAH
LW08-04	8	0	6	6	8	grass and gravel at surface - soil mixed w/20% grit	tan sand, medium grain, subround, well sorted, dry	
LW08-05	7	2	4	0	2	blast grit, no soil	topsoil	
				4	7		tan sand, fine grained, well sorted, dry	
LW08-06	9	4	6	0	4	grit mixed w/soil, 40% grit	silty sand, medium brown, dry, loose, well sorted	
				6	9		light tan sand, well sorted, dry, loose, fine grained	
LW08-07	10	0	4	4	10	medium brown silty sand, trace grit at surface and at 4"	medium brown to light brown silty sand, well sorted, dry, loose, fine grained	
LW08-08	14	0	12	12	14	traces of grit, wood, dark/medium brown silty sand, poorly sorted	light tan sand, dry, well sorted, loose, fine grained.	
LW08-09	10			0	10		topsoil, sand, light brown, well sorted, loose, dry	
LW08-10	13			0	13		silty sand, medium/dark brown, dry - light brown sand, loose, moist, well sorted, fine grained	
LW08-11	8			0	8		medium/dark sand w/some silt, loose, dry - very pale orange sand, fine grained, loose, moist, well sorted	
LW08-12	12			0	12		medium/dark sand w/some silt, loose, dry - very pale brown sand, fine grained, loose, moist, well sorted	
LW08-13	7	0	5	5	7	80% grit	very pale brown sand, fine grained, loose, moist, well sorted	
LW08-14	6	0	2	2	6	soil mixed with grit 20% grit	very pale brown sand, fine grained, loose, moist, well sorted	

TAE 2.1

NAB Little Creek

SWMU 8 West Annex Sandblast Area

Summary of Boring Data

Boring Location	Boring Depth (inches)	Grit Top (inches)	Grit Bottom (inches)	Soil Top (inches)	Soil Botom (inches)	Grit Description	Soil Description	Comments
LW08-15	7	0	2	2	7	soil mixed with 30% grit	very pale brown sand, fine grained, loose, dry, well sorted	
LW08-16	10	0	5	5	10	20-30% grit mixed w/medium brown soil	very pale brown sand, dry, well sorted, fine grained, loose	
LW08-17	6	0	3	3	6	meidum brown soil with trace grit to 3", loose, dry	very pale brown sand, fine grained, loose, moist, well sorted	
LW08-18	8	0	5	5	8	30% grit mixed w/soil	very pale brown sand, dry, well sorted, fine grained, loose	
LW08-19	14	0	10	10	14	grit and soil mixture, 60-70% grit	very pale brown sand, dry, well sorted, fine grained, loose	
LW08-20	7	0	5	5	7	0-3" 10% grit mixed w/soil; 3-5" 50% grit	very pale brown sand, dry, well sorted, fine grained, loose	
LW08-21	9	0	8	8	9	medium brown sand with trace of blast grit	well sorted sand, very pale brown	
LW08-22	7			0	7		silt and gravel, loose, dry, medium brown	
LW08-23	9			0	9		dark yellowish orange silt, dry, loose, well sorted - very pale brown sand, loose, well sorted, dry	
LW08-24	3			0	3		very dense silt and gravel, dark yellowish orange, dry	
LW08-25	10			0	10		medium brown sandy silt mixed w/gravel, poorly sorted, dry	
LW08-26	8			0	8		gravel and silt, loose, dry, very pale brown sand, loose, dry, well sorted	
LW08-27	8			0	8		topsoil and gravel, very pale brown sand, loose, well sorted, fine grained, subround grains	
LW08-28	8			0	8		topsoil and gravel, very pale brown sand, loose, well sorted, fine grained, subround grains	
LW08-29	14	0	12	12	14	20% grit, sand, dark gray, strong petroleum odor	very pale brown sand, loose, well sorted, fine grained, petroleum odor	
LW08-30	8	0	2	2	8	10% grit mixed w/soil	silty sand, dark yellowish orange, loose, dry - pale brown sand, loose, fine grained, dry, well sorted	
LW08-31	7			0	7	30-50 % grit at surface only	gravel and dark yellowish orange silt	

TAB 2.1

NAB Little Creek
SWMU 8 West Annex Sandblast Area
Summary of Boring Data

Boring Location	Boring Depth (inches)	Grit Top (inches)	Grit Bottom (inches)	Soil Top (inches)	Soil Botom (inches)	Grit Description	Soil Description	Comments
LW08-32	8	0	4	4	8	30% grit mixed w/soil	sand, very pale brown, loose, dry, fine grained	
LW08-33	8	0	6	6	8	silty sand trace blast grit	sand, very pale brown, loose, dry, fine grained	
LW08-34	8	0	4	4	8	silty sand and trace blast grit	sand, very pale brown, loose, dry, fine grained	
LW08-35	8	0	5	5	8	soil mixed w/10% grit	sand, very pale brown, loose, dry, fine grained	
LW08-36	6	0	0.5	0.5	6	grit 100% at surface	medium brown silty sand, dry - sand, very pale brown, loose, dry, fine grained	

Estimated Volume

Based on the preliminary field investigation to identify the extent of blast grit at SWMU 8, approximately 1,800 cubic yards of ABM and ABM/soil is estimated for the non-time critical removal action as shown in Figure C-1 in Appendix C.

These areas are delineated on Figure C-1 in Appendix C.

Analytical Data

Results of analysis of the three blast grit samples (LW08-01-SS-00, LW08-02-SS-00, and LW08-03-SS-00) are presented in Tables 2-2 (TCLP results) and 2-3 (total metals, pesticides, and PAHs). Samples collected for characterization of blast grit were grab surface samples biased for the presence of paint chips. Analytical results for TCLP show that lead (5.42 mg/L) is the only parameter to exceed TCLP criteria (5 mg/L) and this was exceeded in only one sample (LW08-01-SS-00), located under Water Tower 1553. All remaining TCLP parameters, and reactivity, corrosivity, and ignitability were below criteria for defining a hazardous waste.

Analytical results were compared to residential and industrial risk-based concentrations (RBCs) developed by Region III EPA. A value of 400 mg/kg (current EPA guidance, residential) was the criteria used for comparison to lead results. Results for total metals show that lead and arsenic in all three blast grit samples exceed residential RBCs. Two of the three samples also exceed the industrial RBC for arsenic of 3.82 mg/kg, and all of the samples exceed the industrial action level for lead of 1,000 mg/kg (US EPA Region II or III Guidance). The presence of arsenic is considered a background issue at the site. Several PAHs were detected in the sample from beneath the water tower (LW08-01-SS-00), five of which exceeded residential RBCs. Of these, one compound, benzo(a)pyrene exceeded the industrial RBC. Three pesticides were also detected in the samples, but all values were well below residential RBCs.

Although some compounds exceed residential RBCs, for the purposes of waste disposal, ABM/soil excavated for removal is expected to be considered non-hazardous. The TCLP sample from the small area around Water Tower 1553 represents a grab sample biased for the presence of paint chips, and when excavated, a composite sample of the waste also would likely be characterized non-hazardous.

TAB 2.2
SWMU 8 West Annex Sandblast Area
Blast Grit TCLP Sample Results
January 21, 2000

Constituents TLCP METALS (mg/L)	LW08-01-SS-00	LW08-02-SS-00	LW08-03-SS-00	TCLP Limits mg/L
Arsenic	ND	0.155	0.084	5
Barium	0.520	0.337	0.259	100
Cadmium	ND	ND	ND	1
Chromium	ND	ND	ND	5
Lead	**5.42**	1.18	0.469	5
Mercury	ND	ND	ND	0.2
Selenium	ND	ND	ND	1
Silver	ND	ND	ND	5
TCLP-SEMIVOLATILE (ug/L)	**LW08-01-SS-00**	**LW08-02-SS-00**	**LW08-03-SS-00**	**TCLP Limits (mg/L)**
1,4-Dichlorobenzene	ND	ND	ND	7.5
2,4,5-Trichlorophenol	ND	ND	ND	400
2,4,6-Trichlorophenol	ND	ND	ND	2
2,4-Dinitrotoluene	ND	ND	ND	0.13
2-Methylphenol	ND	ND	ND	
3+4-Methylphenol	ND	ND	ND	
Hexachlorobenzene	ND	ND	ND	0.13
Hexachlorobutadiene	ND	ND	ND	0.5
Hexachloroethane	ND	ND	ND	3
Nitrobenzene	ND	ND	ND	2
Pentachlorophenol	ND	ND	ND	100
Pyridine	ND	ND	ND	5
TCPL RCI	**LW08-01-SS-00**	**LW08-02-SS-00**	**LW08-03-SS-00**	**TCLP Limits (mg/L)**
CORROSIVITY pH	5.90	6.28	5.80	<2.5; >12
IGNITABILITY	ND	ND	ND	
REACTIVE CYANIDE(COLOROMETRIC)	ND	ND	ND	200
REACTIVE SULFIDE	ND	0.95	ND	500

TABLE 2-3
NAB Little Creek
SWMU 8 West Annex Sandblast Area
Blast Grit Sample Results
January 21, 2000

Constituents Depth TOTAL METALS (mg/kg)	LW08-01-SS-00	LW08-02-SS-00	LW08-03-SS-00	Soil RBC Residential mg/kg[1]	Soil RBC Industrial mg/kg[1]
Aluminum	1080 *	9080 *	9520 *	78000	2000000
Antimony	10.5 N	41.1 N	43.9 N	31	820
Arsenic	**0.56** U	**11**	**16**	0.43	3.8
Barium	125	331	327	5500	140000
Beryllium	0.18 B	10.00	9.60	160	4100
Cadmium	0.55 B	0.37 B	0.86	40	1000
Calcium	203 B	5420	5390		
Chromium	177	142	47.4	200	6100
Cobalt	3 B	106	69.3	4700	120000
Copper	42.1	3430	1090	3100	82000
Iron	5250.0	50900.0	55900.0	23000	610000
Lead	**1820** E	**1550** E	**1070** E	400 guidance	1000 guidance
Magnesium	220 B	2930	3140		
Manganese	56.9	695	714	1600	41000
Mercury	0.11 U	0.11 U	0.11 U		
Nickel	7.7	433	55.7	1600	41000
Potassium	398.0 B	1810.0	2430.0		
Selenium	0.67 UN	2.9 N	3.1 N	390	10000
Silver	3.3	0.67 B	0.17 U	390	10000
Sodium	1640.0	10200.0	9290.0		
Thallium	0.37 U	0.38 U	0.35 U	5.5	140
Vanadium	2.6 B	24.1	20.6	550	14000
Zinc	1640 E*	9130 E*	8900 E*	23500	610000
Cyanide	0.11 U	ND	ND	1600	41000
PESTICIDES (mg/kg)	**LW08-01-SS-00**	**LWO8-02-SS-00**	**LW08-03-SS-00**		
4,4'-DDT	0.011	0.0024 JP	2.20 JP	2	170
4,4-DDE	ND	0.0015 J	ND	2	170
4,4-DDD	ND	0.00089 JP	ND	3	240
SEMIVOLATILES (mg/kg)	**LW08-01-SS-00**	**LW08-02-SS-00**	**LW08-03-SS-00**		
Anthracene	0.2 J	0.37 U	0.35 U	23500	610000
Benzo (a) anthracene	**2.7**	0.37 U	0.35 U	0.87	7.8
Benzo (a) pyrene	**1.7**	0.37 U	0.35 U	0.087	0.78
Benzo (b) fluoranthene	**2.7**	0.37 U	0.35 U	0.87	7.8
Benzo (g, h, I) perylene	0.25 J	0.37 U	0.35 U		
Benzo (k) fluoranthene	1.4	0.37 U	0.35 U	8.7	78
bis (2-Ethylhexyl) phthalate	45 D	0.31 J	0.32 J	87	780
Carbazole	0.19 J	0.37 U	0.35 U	32	290
Chyrsene	24	0.37 U	0.35 U	87	780
Dibenz (a,h) anthracene	**0.51**	0.37 U	0.35 U	0.087	0.78
Fluoranthene	4 D	0.37 U	0.35 U	3100	82000
Indeno (1,2,3-cd) pyrene	**1.3**	0.37 U	0.35 U	0.87	7.8
Phenanthrene	1.1	0.37 U	0.35 U		
Pyrene	5.6 D	0.37 U	0.35 U	2300	61000

Note: bold values exceed Residential RBCs

N- spiked sample recovery was not within control limits

J- estimated below the contract required quantitation limit

E- organics exceeded calibration range; E inorganic is estimated because of interference

B- for inorganics only below the contract required detection limit but above the instrument detection limit

D- from diluted run

* duplicate analysis was not within the control limits

[1] VALUES FROM EPA REGION III RBC TABLE DATED 4/13/2000

SECTION 3

Identification of Remedial Action Objectives

3.1 Statutory Limits on Removal Action

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) 40 CFR Part 300.415 dictates statutory limits of $2 million and 12 months of USEPA fund-financed removal actions, with statutory exemptions for emergencies and actions consistent with the remedial action to be taken. This removal action will not be USEPA fund-financed. The Navy/Marine Corps Installation Restoration (IR) Manual does not limit the cost or duration of the removal action; however, cost-effectiveness is a recommended criterion for evaluation of removal action alternatives.

3.2 Removal Action Scope and Objective

3.2.1 Removal Action Objective

The removal action objective for SWMU 8 is to reduce the current risk to human health and the environment posed by ABM by removing blast grit to levels meeting EPA Region III RBCs for residential use to reduce exposure to on-site workers and a nearby off-site residential area. This will be done by:

- Characterization of the material to be excavated prior to excavation in order to ensure proper disposal facilities are selected
- Excavation of ABM material and soil contaminated with ABM
- Continuing to restrict access to the site during the removal
- Transport, stabilization (if necessary), and disposal of the contaminated ABM and soil at a permitted disposal facility
- Confirmation sampling and testing of areas where ABM was removed
- Restoration of the site

3.2.2 Removal Action Scope

The objective of this proposed action will be to remove ABM and ABM-contaminated soil in the vicinity of Water Tower 1553 to levels meeting EPA Region III RBCs for residential use. This area is indicated on Figure 1-2. Sample data for this material collected during a site reconnaissance indicates that lead levels in the ABM exceed both the 400 mg/kg screening value for residential areas and the 1,000 mg/kg screening value for industrial areas.

The horizontal limits for ABM removal will be visually determined during removal. Based upon the preliminary site investigation data, the removal action will disturb approximately

three acres. The vertical limits for blast grit removal will be visually determined based upon color and consistency.

Field screening of lead concentrations in the surrounding and underlying soil may also be conducted to provide real time analysis for quantitatively determining the limits of further excavation. Use of a NITON XL-700 series instrument can provide in-situ as well as real-time on-site analysis of metal concentrations in soil. The use of portable x-ray fluorescence technology will be applicable for the removal alternatives with quantitative action levels for lead concentrations in soil. The procedure follows EPA draft Method 6200 *"Testing Soils and Sediments with Field Portable X-Ray Fluorescence Analyzers"*. In-situ analysis can be completed in a few minutes and turnaround time for on-site sample analysis would be on the order of 15 to 20 minutes. Detection limits for lead with a standard resolution instrument is expected to be 30 ppm. A *Work Plan and Sampling and Analysis Plan, Removal Action, SMMU 8, Naval Amphibious Base Little Creek* (CH2M) is currently being prepared which further summarizes all confirmation sampling to be conducted as part of the Removal Action. Confirmation sampling includes total lead (48 hour turn around) for verification of XRF results approximately 15 samples (1 per 10,00 sq. ft.) for TAL metals and PAHs, and three samples for full TAL metals and TCL organics. The Work Plan will be submitted to supplement the RAC Work Plan.

Following completion of the Removal Action, an R7 will be completed on the SMMU 8 to evaluate the effectiveness, and to assess any potential residual hazards to human health or the environment.

3.3 Determination of Removal Schedule

Once the EE/CA has been finalized, it is placed in the Administrative Record, and notice of its availability for public review, along with a brief summary, are published in the local newspaper. The EE/CA is then subjected to a 30-day public comment period. Written responses to significant comments will be prepared and included in the Administrative Record. Since this removal action has been designated non-time-critical, the start date will be determined by factors other than the urgency of the threat. Possible factors include weather conditions, the availability of resources, and site constraints.

A preliminary breakdown of the schedule is provided in Gantt chart form in Figure 3-1. The total project period is expected to last 5 months from the end of the public comment period to completion of this removal action. Critical milestones periods are summarized below:

- EE/CA Public Comment Period–30 days
- Preparation of Work Plan– 30 days
- Subcontracting and Mobilization–30 days
- Removal Action–15 to 30 days
- Confirmatory Analytical Results and Report Writing–45 days

The removal action time frame includes the time required for mobilization and setup of equipment, and performing the selected removal action. Section 4 provides details regarding the amount of time necessary to complete the removal action.

3.4 Applicable or Relevant and Appropriate Requirements

The removal action will, to the extent practicable, comply with applicable or relevant and appropriate requirements (ARARs) under federal and state environmental laws, as described in 40 CFR 300.415. Other federal and state advisories, criteria, or guidance will, as appropriate, be considered in formulating the removal action. Applicable requirements are those requirements specific to the conditions at SWMU 8 that satisfy all jurisdiction prerequisites of the law or requirements. Relevant and appropriate requirements are those that do not have jurisdiction authority over the particular circumstances at SWMU 8, but are meant to address similar situations, and therefore are suitable for use at SWMU 8. Federal ARARs are determined by the lead agency, which in this case is the Department of the Navy. As outlined by 40 CFR 300.415(j), the lead agency may consider the urgency of the situation and the scope of the removal action to be conducted in determining whether compliance with ARARs is practicable.

The NCP, 40 CFR 300.400(g)(2), specifies factors to consider in determining what requirements of other environmental laws are relevant and appropriate:

- The purpose of the requirement in relation to the purpose of CERCLA
- The media regulated by the requirement
- The substance(s) regulated by the requirement
- The actions or activities regulated by the requirement
- Variations, waivers, or exemptions of the requirement
- The type of place regulated and the type of place affected by the release or CERCLA action
- The type and size of the facility or structure regulated by the requirement or affected by the release
- Consideration of the use or potential use of affected resources in the requirement

In some circumstances, a requirement may be relevant to the particular site-specific situation but may not be appropriate because of differences in the purpose of the requirement, the duration of the regulated activity, or the physical size or characteristic of the situation it is intended to address. There is more discretion in the judgment of relevant and appropriate requirements than in the determination of applicable requirements.

Three classifications of requirements are defined by USEPA in the ARAR determination process: chemical-specific, location-specific, and action-specific.

Chemical-specific ARARs are health or risk management-based numbers or methodologies that result in the establishment of numerical values for a given media that would meet the NCP "threshold criterion" of overall protection of human health and the environment. These requirements generally set protective cleanup concentrations for the chemicals of concern in the designated media, or set safe concentrations of discharge for remedial activity. Guidance relevant to the specific chemicals at SWMU 8 includes the RBCs put forth

by US EPA Region III, as shown in Table 2-3. If the soil is classified hazardous, then prohibitions on land disposal specified in 40 CFR, Part 268, may apply.

Location-specific ARARs restrict remedial activities and media concentrations based on the characteristics of the surrounding environments. Location-specific ARARs may include restrictions on remedial actions within wetlands or floodplains, near locations of known endangered species, or on protected waterways. There are no location-specific ARARs for the removal action at SWMU 8. The federal and state of Virginia location-specific regulations that have been reviewed are summarized in Appendix A.

Action-specific ARARs are requirements that define acceptable treatment and disposal procedures for hazardous substances. Federal and State of Virginia Action-specific ARARs that may affect the development and conceptual arrangement of remedial alternatives are summarized in Appendix A.

3.5 General Disposal Requirements

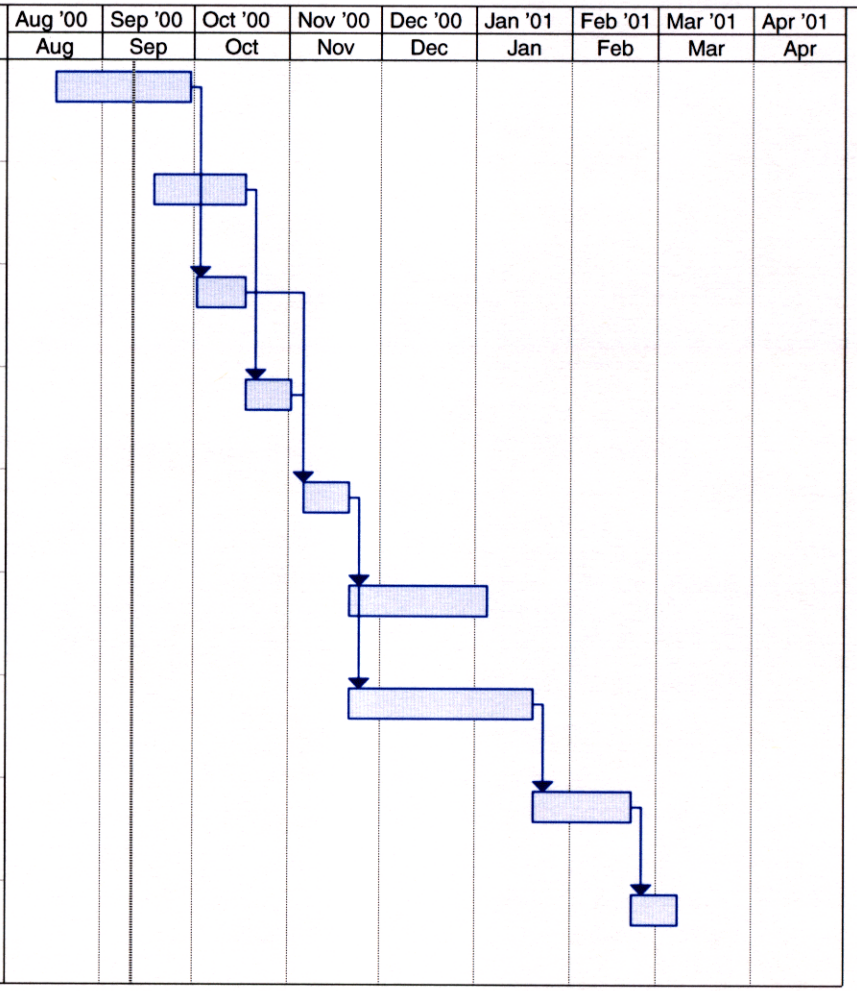
Characterizing the soil contamination by TCLP is critical in determining the status of Resource Conservation and Recovery Act (RCRA) requirements. RCRA "operating" hazardous waste management regulations are not applicable unless hazardous waste material is excavated. If soil is treated on the site and some of the material being treated is a hazardous waste, the treatment units will need to meet the substantive requirements for a RCRA permit.

A waste characterization will include, at a minimum, a description of the waste, the waste quantity, and laboratory results on representative samples using USEPA's TCLP metals methods. Characterization sampling can either be conducted in-situ (prior to excavating the soils) or ex-situ (after excavating the soils), in order to determine soil staging and disposal requirements. For non-hazardous solid wastes, characterization of this material will be conducted in accordance with the disposal facility requirements. In addition to a waste characterization, written permission must be obtained from the receiving facility and from the state in which the disposal facility is located (if applicable).

Material that is characterized as hazardous or not acceptable for local subtitle D landfill disposal may require stabilization prior to disposal in a hazardous waste permitted landfill. All stabilized material must meet the treatment requirements outlined in 40 CFR Part 268.40. For lead, the leachability must be below 0.75 mg/L.

FIGURE 3-1
NAB LITTLE CREEK
SWMU 8 EE/CA FOR THE REMOVAL ACTION

ID	Task Name	Duration	Start	Finish
1	Regulatory Review of RAC DRAFT Work Plan for Removal Action	44 days	Thu 8/17/00	Fri 9/29/00
2	Public Review and Comment on EE/CA; Regulatory Review of DRAFT Sampling and Analysis Plan for Confirmation Sampling	30 days	Mon 9/18/00	Tue 10/17/00
3	Finalize RAC Work Plan for Removal Action	16 days	Mon 10/2/00	Tue 10/17/00
4	Finalize Sampling and Analysis Plan for Confirmation Sampling; Incorporate Significant Public Comments on EE/CA into Adminstrative Record	15 days	Wed 10/18/00	Wed 11/1/00
5	SWMU 8 Removal Action and Confirmation Sampling	15 days	Mon 11/6/00	Mon 11/20/00
6	Laboratory Analysis and Data Validation of Confirmation Samples	45 days	Tue 11/21/00	Thu 1/4/01
7	Removal Action DRAFT Closeout Report (by RAC) including DRAFT Letter Report on Confirmation Sampling Results by CH2M HILL	60 days	Tue 11/21/00	Fri 1/19/01
8	Regulatory Review of DRAFT Closeout Report	32 days	Sat 1/20/01	Tue 2/20/01
9	Removal Action Closeout Report (by RAC) including FINAL Letter Report on Confirmation Sampling Results by CH2M HILL	15 days	Wed 2/21/01	Wed 3/7/01



Project: scheduleestimate
Date: Mon 9/11/00

Task
Split
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Split
Rolled Up Milestone
Rolled Up Progress
External Tasks
Project Summary

00415A02Y

SECTION 4

Description of Removal Action Alternatives

Three removal alternatives were developed using best professional judgment. All alternatives involve excavating the ABM. The differences between the three alternatives consist of approaches to cleanup criteria of the ABM/soil.

The primary contaminant of concern at SWMU 8 is an inorganic compound, lead, which cannot be further reduced chemically. As discussed in Section 2, arsenic also was found to be present at the site at levels that exceeded risk-screening criteria, but is considered a background issue at the site and therefore not part of the removal action objectives. Treatment alternatives for lead are limited and generally involve isolation, removal, or stabilization of the lead. This issue is further complicated by the fact that the contaminated media is ABM, which once the lead is removed, is still considered a solid waste and would require disposal in accordance with state and federal regulations. This situation limits the number of remedies that can be employed at this site. On-site treatment options that might be suitable for removing the lead from the media would still involve transport and disposal of the treated ABM to a local landfill or other suitable disposal facility. This reduces the cost effectiveness of these options. For this reason, remedies such as soil washing or other similar technologies were screened out prior to developing the final alternatives for this evaluation. Since the ABM will require proper disposal, despite the residual levels of lead, only these types of options were considered.

Once removal alternatives were developed, each one was evaluated individually according to its effectiveness, ease of implementation, and total present-value cost. A summary of the alternative and its evaluation is provided in Table 4-1.

The *effectiveness* of a technology refers to its capability of removing the specific contaminants in the volumes required, the degree to which the technology achieves the removal action objective, and the reliability and performance of the technology over time. The *ease of implementation* of a technology refers to the availability of commercial services to support it, the constructability of the technology under specific site conditions, and the acceptability of the technology to all parties involved (regulators, public, owner, etc.). For the *detailed cost analysis* of alternatives, the expenditures required to complete each measure were estimated in terms both of capital and annual operation and maintenance (O&M) costs. Given these values, a present-worth calculation for each alternative can be made for comparison.

Capital costs consist of direct and indirect costs. Direct costs include the cost of construction, equipment, land and site development, treatment, transportation, and disposal. Indirect costs include engineering expenses, license or permit costs, and contingency allowances. Annual O&M costs are the post-construction costs required ensuring the continued effectiveness of the remedial action. No O&M costs are anticipated for any of the alternatives.

The cost estimates for this section are provided to an accuracy of +50 percent to -30 percent. The alternative cost estimates are in year 2000 dollars and are based on information published in R.S. Means Environmental Cost Data (ECHOS 2000). Where Means data was not available or not applicable, phone quotes or engineering estimates were used for unit pricing.

Table 4-1
Evaluation of Soil Removal Action Alternatives
Little Creek SWMU 8 EE/CA

Alternative	Description	Effectiveness	Ease of Implementation	Cost
Alternative No. 1 Excavation of visible ABM with offsite landfill disposal	Characterize solid in advance of excavation. Remove visible ABM with an excavator. Transport ABM to a Subtitle D (local) landfill for disposal, unless some material is found to be hazardous. Hazardous material portion would be transported, stabilized, and disposed in a hazardous waste Subtitle C (out of state) landfill.	Bulk of the lead-containing material is removed from area. Risk of exposure to contaminants and further spread of contaminated soil is reduced by removal of ABM. Further erosion of the contaminated soil is prevented by stabilization. All risk may not be removed; further remedial action and land-use restrictions may be required after RI/FS.	Implementation would be straightforward. A number of contractors are capable of excavating and disposing of lead-containing soil. Fewer disposal facilities are available to stabilize and dispose of hazardous waste, which requires transportation out of state.	**$366,000,** if classified as non-hazardous **$513,000,** (est.) if a portion is classified as hazardous requiring disposal in a Subtitle C landfill
Alternative No. 2 Excavation to residential action level for lead and offsite landfill disposal.	Characterize solid in advance of excavation. Remove ABM/soil material to residential action level (400 mg/kg) with an excavator. Transport to a Subtitle D (local) landfill for disposal, unless some material is found to be hazardous. Hazardous material portion would be transported, stabilized, and disposed in a hazardous waste Subtitle C (out of state) landfill.	Similar to Alternative 1, effectiveness is potentially greater since material is removed to a specific (residential) cleanup standard. Bulk of lead-containing material is removed from area. Risk of exposure to contaminants and further spread of contaminated soil is reduced by removal of these areas of ABM. Further erosion of the contaminated soil is prevented by stabilization. Reduces possibility that further remedial action/land-use restrictions would be required for soil after RI/FS.	Implementation would be straightforward. A number of contractors are capable of excavating and disposing of lead-containing soil. Fewer disposal facilities are available to stabilize and dispose of waste, which requires transportation out of state. In comparison to Alternative 1, requires additional field screening to ensure that the specific cleanup standard is met.	**$427,000,** if classified as non-hazardous **$539,000,** (est.) if a portion is classified as hazardous requiring disposal in a Subtitle C landfill
Alternative No.3 Excavation to industrial action level for lead and offsite landfill disposal.)	Characterize solid in advance of excavation. Remove ABM/soil material to industrial action level (1000 mg/kg) with an excavator. Transport to a Subtitle D (local) landfill for disposal, unless some material is found to be hazardous. Hazardous material portion would be transported, stabilized, and disposed in a hazardous waste Subtitle C (out of state) landfill.	Similar to Alternative 1, effectiveness is potentially greater since material is removed to a specific (industrial) cleanup standard but potentially less than Alternative 2; may require land-use restrictions or further remediation after RI/FS. Bulk of the lead-containing material is removed. Risk of exposure to contaminants and further spread of contaminated soil is reduced by removal of ABM. Further erosion of the contaminated soil is prevented by stabilization.	Implementation would be straightforward. A number of contractors are capable of excavating and disposing of lead-containing soil. Fewer disposal facilities are available to stabilize and dispose of waste, which requires transportation out of state. In comparison to Alternative 1, requires additional field screening to ensure that the specific cleanup standard is met.	**$395,000,** if classified as non-hazardous **$530,000,** (est.) if a portion is classified as hazardous requiring disposal in a Subtitle C landfill

4.1 Alternative 1—Excavation of Visible ABM with Offsite Disposal

The goal of this alternative is to remove visible blast grit, consisting of approximately 1,800 cubic yards of ABM/soil mixture from four separately delineated sections in the sandblasting and residue storage areas (see Figure 1-2). The area and depth estimates for the development of this quantity is provided in Appendix C. This action will serve to remove the lead contaminated ABM to help to reduce potential risks to human health and the environment.

For this alternative the ABM will be removed from the site and disposed of in a landfill. No treatment or chemical stabilization occurs. The ABM and soil will be contained in a landfill that is permitted to accept the material. It is assumed that the material will be classified as a non-hazardous waste and can be accepted by a local landfill, based on initial analytical results. However, it is possible that a portion of the waste will require disposal in a hazardous waste landfill, so a range of cost estimates was provided to account for this possible variation.

The following steps will be involved in this alternative:

- The soil and ABM will be characterized in place. Sample frequency and analytical methods will be based upon local landfill requirements.
- Once the characterization is complete, the contractor will mobilize to the site and the excavation of the ABM and ABM/soil mixture will occur.
- Since characterization was completed in advance, material will be loaded directly into dump trucks and hauled to a local RCRA subtitle D landfill for disposal (if classified as an acceptable non-hazardous waste). If a portion of the waste is classified as hazardous waste, this portion will be hauled to a RCRA subtitle C waste landfill for disposal.
- Confirmation samples will be collected from the soils located directly beneath the excavated ABM to characterize the soil that is left in place for the follow-on RI and risk assessment.
- Following the excavation, the site will be restored to the original grades by placing clean earth fill material in the area where ABM was removed.
- Following the backfill operations, the disturbed areas will be fine graded and revegetated, and the gravel road will be restored, as necessary.

The long-term effectiveness of Alternative No. 1 is high. The alternative will reduce the risks to human health and the environment by removing the material that poses the greatest risk, but does not ensure that all risk is removed. The confirmation sampling may determine that sufficiently high concentrations of metals remain in the soil such that further excavation or land-use restrictions will be required after the RI/FS is complete.

Over the short term, there would be a slightly increased risk to workers involved in the excavation and disposal of the soil. However, adequate protection will be in place to ensure that workers are not exposed to contamination.

Alternative No. 1 would be straightforward to implement. Excavation could be carried out in a short time. Waste storage, analysis, hauling, and disposal would be routine activities for waste-hauling contractors. Assuming disposal of all of the excavated material in a local RCRA Subtitle D landfill is acceptable, this alternative is estimated to have a total present-value cost of $366,000 (Alternative 1A).

Should a portion of the excavated material be found to not be suitable for disposal in a local subtitle D landfill, it will require hauling to a RCRA Subtitle C landfill for stabilization (that meets land-disposal regulations for lead), and disposal. The closest facilities that can accept and dispose of this material are located in Pennsylvania. This would result in a significant increase in costs. Segregation of the material to reduce the volume based upon contaminant characteristics, where possible, would be essential to help reduce the total costs. Hazardous waste storage, analysis, hauling, and disposal are not necessarily routine activities and can be very costly. Regulations and costs relating to transportation and disposal of hazardous material need to be strictly followed and serve to keep the cost relatively high. For cost estimating purposes, it was assumed that up to 25 percent of the waste, or 600 tons, could be classified as hazardous. Based on this assumption, this alternative is estimated to have a total present-value cost of $513,000 (Alternative 1B). The cost breakdown for Alternative 1A and 1B is provided in Appendix B.

4.2 Alternative 2—Excavation to Residential Screening Standard and Offsite Disposal

The goal of this alternative is to excavate ABM/soil that is contaminated with lead, to achieve a residential cleanup level in the soil of 400 mg/kg of lead. This alternative is similar to Alternative 1 with the exception of the volume of material to be excavated, and the requirement for field testing to determine if cleanup levels have been met. The additional quantity of material that will require removal cannot be determined until testing begins concurrent with the removal action. However, for cost estimating purposes, this removal action is approximated by assuming that in addition to the removal of ABM material to depths measured during the preliminary site investigation, an estimated 20% of the total volume will be required to achieve this cleanup goal. This approach results in a volume of approximately 2,200 cubic yards of ABM and soil to be excavated for disposal.

This action will serve to remove the lead contaminated ABM and any surrounding or underlying contaminated soil, to help to reduce potential risks to human health and the environment, with possibly greater reliability than that of Alternative 1.

The long-term effectiveness of Alternative No. 2 is high. The alternative will reduce the risks to human health and the environment by removing the lead contamination in the soil to a level that would be protective for any future use of the property, and would significantly reduce the likelihood that future remedial actions (including land-use restrictions) would be required to address the soil at the site. Over the short term, there would be a slightly increased risk to workers involved in the excavation and disposal of the soil. However, adequate protection will be in place to ensure that workers are not exposed to contamination.

Alternative No. 2 would be somewhat more complicated to implement than Alternative 1 because it would require coordination with onsite sampling and analysis. There is also the unknown of how much soil must be removed to achieve lead levels lower than 400 mg/kg. Like Alternative 1, excavation could be carried out in a short time. Waste storage, analysis, hauling, and disposal would be routine activities for waste-hauling contractors. Assuming disposal of all the excavated material in a local RCRA subtitle D landfill is acceptable, this alternative is estimated to have a total present-value cost of $427,000 (Alternative 2A).

As with Alternative 1, should a portion of the excavated material be found to not be suitable for disposal in a local subtitle D landfill, it will require hauling to a RCRA Subtitle C landfill for stabilization (that meets land-disposal regulations for lead), and disposal. The closest facilities that can accept and dispose of this material are located in Pennsylvania. This would result in a significant increase in costs. Segregation of the material to reduce the volume based upon contaminant characteristics, where possible, would be essential to help reduce the total costs. Hazardous waste storage, analysis, hauling, and disposal are not necessarily routine activities and can be very costly. Regulations and costs relating to transportation and disposal of hazardous material need to be strictly followed and serve to keep the cost relatively high. For cost estimating purposes, it was assumed that the same volume of excavated material as in Alternative 1B, or 600 tons, could be classified as hazardous. Based on this assumption, this alternative is estimated to have a total present-value cost of $539,000 (Alternative 2B). The cost breakdown for Alternative 2 is provided in Appendix B.

4.3 Alternative 3—Excavation to Industrial Screening Standard and Offsite Disposal

The goal of this alternative is to excavate ABM/soil that is contaminated with lead, to achieve the industrial cleanup level in the soil of 1,000 mg/kg of lead. This alternative is similar to Alternative 1 with the exception of the volume of material to be excavated, and the requirement for field testing to determine if cleanup levels have been met. The additional quantity of material that will require removal cannot be determined until testing begins concurrent with the removal action. However, for cost estimating purposes, this removal action is approximated by assuming that in addition to the removal of ABM materialto depths measured during the preliminary investigation, an addition 10% of the volume will be required to achieve this cleanup goal. This approach results in a volume of approximately 2,000 cubic yards of ABM and soil to be excavated for disposal.

This action will serve to remove the lead contaminated ABM and surrounding or underlying contaminated soil, to help to reduce potential risks to human health and the environment, with possibly greater reliability than that of Alternative 1.

The long-term effectiveness of Alternative No. 3 is also high and is greater than Alternative 1 but less than Alternative 2. The alternative will reduce the risks to human health and the environment by removing the lead contamination in the soil to a level that will be protective for most likely future use scenarios consistent with a Navy base, and would reduce the likelihood that future remedial action would be required to address soil at the site. Land-use restrictions would likely have to be part of any future remedial action.

Over the short term, there would be a slightly increased risk to workers involved in the excavation and disposal of the soil. However, adequate protection will be in place to ensure that workers are not exposed to contamination.

The implementation of Alternative No. 3 similar to Alternative 2. The biggest issue would be the unknown quantity of soil to be excavated. It is unknown how much soil must be removed to achieve lead levels lower than 1,000 mg/kg. Excavation could be carried out in a short time. Waste storage, analysis, hauling, and disposal would be routine activities for waste-hauling contractors. Assuming disposal of all of the excavated material in a local RCRA subtitle D landfill is acceptable, this alternative is estimated to have a total present-value cost of $395,000 (Alternative 3A).

As with Alternative 1, should a portion of the excavated material be found to not be suitable for disposal in a local subtitle D landfill, it will require hauling to a local RCRA subtitle C landfill for stabilization (that meets land-disposal regulations for lead), and disposal. The closest facilities that can accept and dispose of this material are located in Pennsylvania. This would result in a significant increase in costs. Segregation of the material to reduce the volume based upon contaminant characteristics, where possible, would be essential to help reduce the total costs. Hazardous waste storage, analysis, hauling, and disposal are not necessarily routine activities and can be very costly. Regulations and costs relating to transportation and disposal of hazardous material need to be strictly followed and serve to keep the cost relatively high.

For cost estimating purposes, it was assumed that the same volume of excavated material as in Alternative 1B, or 600 tons, could be classified as hazardous. Based on this assumption, this alternative is estimated to have a total present-value cost of $530,000 (Alternative 3B). The cost breakdown for Alternative 2 is provided in Appendix B.

SECTION 5

Comparative Analysis

Section 5 provides a comparative analysis of the three removal and disposal alternatives to assist the decision-making process by which a removal action will be selected. Previously, the alternatives were evaluated according to their effectiveness, ease of implementation, and cost. In this section, the alternatives are directly compared for each of the three criteria. From this analysis, it should become clear which alternative is preferable in each category and, consequently, which alternative will be selected for implementation at SWMU 8. Table 5-1 is a summary of the comparative analysis.

Table 5-1
Comparative Analysis Summary

Alternative	Effectiveness	Implementation	Cost
Alternative No. 1 --Excavation of visible ABM with Offsite Disposal (All classified as non-hazardous or a portion non-hazardous, a portion hazardous requiring hazardous waste landfill disposal)	High	Easy	Lowest
Alternative No. 2 -- Excavation to residential action level for lead and offsite disposal. (All classified as non-hazardous or a portion non-hazardous, a portion hazardous requiring hazardous waste landfill disposal)	Highest	Moderately Easy	Moderate
Alternative No. 3– Excavation to industrial action level for lead and offsite disposal. (All classified as non-hazardous or a portion non-hazardous, a portion hazardous requiring hazardous waste landfill disposal)	Higher	Moderately Easy	Low

5.1 Effectiveness

The overall effectiveness of all alternatives is high. These levels of effectiveness were assessed based on the number of "effectiveness criteria" that would be satisfied by each alternative. The "effectiveness criteria," from the USEPA guidance document *Guidance on Conducting Non-Time Critical Removal Actions Under CERCLA* (EPA/540-R-93-057), are identified as:

- Protection of public health
- Protection of workers during implementation
- Protection of environment
- Compliance with ARARs
- Level of treatment and containment expected
- Residual effect concerns

All three of the alternatives have been developed because they were able to achieve the removal action objective. If the removal action objective is achieved, then public health is protected. Therefore, all three alternatives satisfy the first criterion.

Workers can be protected during implementation of all three alternatives using standard respiratory and skin protection. The environment is protected through the removal of contaminated soil from the site.

Each of the three alternatives can comply with the location-specific and action-specific ARARs, which apply to the implementation of the alternatives. No environmentally sensitive locations are known to be present at SWMU 8; the removal action will not endanger groundwater or surface water; and regulations regarding excavations, air emissions, storage, and transportation will be complied with.

Although all three alternatives are protective of human health and the environment, Alternative 2, using a residential cleanup level with confirmation by field testing, may provide slightly more protection than Alternative 3, which in turn may be slightly more protective than Alternative 1.

Both Alternatives 2 and 3 go beyond the removal action objectives by attempting to eliminate or reduce the need for future remedial action of the soil. In the case of Alternative 3, the goal is to provide a property that would be suitable for any future industrial use. Alternative 2 would provide a property suitable for any future use without restrictions.

5.2 Implementability

The implementability evaluation of the alternatives varies from easy to moderately easy. These levels of implementability were assessed based on the number of "implementability criteria" satisfied by each alternative. The "implementability criteria," from the USEPA guidance document *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA* (EPA/540-R-93-057), are as follows:

- Construction and operational considerations
- Demonstrated performance/useful life
- Adaptable to environment conditions
- Contributes to remedial performance
- Can be implemented in 1 year
- Availability of equipment, personnel and services, outside laboratory testing capacity, and offsite treatment and disposal capacity
- Permits required
- Easements or rights-of-way required
- Impact on adjoining property
- Ability to impose institutional controls

Evaluation of implementability essentially comes down to the evaluation of technical and administrative feasibility. The technical feasibility consists of items 1 through 6 above, and administrative feasibility involves items 7 through 10.

All three of the alternatives are technically and administratively feasible. Alternatives 2 and 3 involve field testing for lead concentrations in soil, which mandates additional equipment and operational support.

5.3 Cost

Cost capital, annual O&M, and present-worth cost of each of the alternatives are summarized in Table 5-2. Since there will be no long-term O&M after this removal action, these costs were considered to be zero. This work is scheduled for fiscal year 2000 and 2001. Since the cost data used to develop the construction costs were based upon expected 2000 data, no adjustments to present-worth costs were made. The cost breakdown for each alternative is provided in Appendix B.

Table 5-2
Cost Summary

Alternative	Capital Cost	Annual O&M Cost	Present-Worth Cost
Alternative No. 1 --Excavation of visible ABM with Offsite Disposal (All classified as non-hazardous, or a portion as non-hazardous and a portion hazardous requiring hazardous waste landfill disposal)	$366,000-$513,000	$0	$366,000-$513,000
Alternative No. 2 -- Excavation to residential action level for lead and offsite disposal. (All classified as non-hazardous, or a portion as non-hazardous and a portion hazardous requiring hazardous waste landfill disposal)	$427,000-$539,000	$0	$427,000-$539,000
Alternative No. 3– Excavation to industrial action level for lead and offsite disposal(All classified as non-hazardous, or a portion as non-hazardous and a portion hazardous requiring hazardous waste landfill disposal)	$395,000-$530,000	$0	$395,000-$530,000

SECTION 6

Recommended Alternative

The EE/CA was performed in accordance with current USEPA and Navy guidance documents for an NTCRA under CERCLA. The purpose of this EE/CA was to identify and analyze removal actions to address the material that will be excavated from SWMU 8. Three alternatives were identified, evaluated, and ranked.

The comparative analyses of the removal alternatives included evaluating the effectiveness, implementability, and cost of each alternative. The effectiveness evaluation included reviewing the protectiveness of the alternative and its ability to meet the removal action objectives. Implementability included looking at the technical feasibility, availability, and administrative feasibility of the alternatives. The evaluation of cost included a review of capital cost, operating cost, and present-worth cost.

Based on the comparative analyses of the removal alternatives completed in Section 5.0, the recommended removal action is Alternative 2, Excavation to Residential Screening and Offsite Disposal. Results of surface and subsurface sampling efforts demonstrate that residential screening levels should be readily achieved through implementation of the removal action. This alternative will prevent any future land use restrictions associated with risk to human health or the environment at the site..

SECTION 7

References

CH2M HILL. April 2000. Technical Memorandum Preliminary Delineation of Abrasive Blast Material, SWMU 8 West Annex Sandblast Area, NAB Little Creek, Virginia Beach, Virginia.

Navy/Marine Corps Installation Restoration Manual. 1997.

R.S. Means. 2000. Environmental Remediation Cost Data – Unit Price, 6th Edition

U.S. Code of Federal Regulations. 1990. 40 CFR Part 300. National Oil and Hazardous Substances Pollution Contingency Plan.

U.S. Code of Federal Regulations. 1993. 40 CFR Parts 300-375. Superfund, Emergency Planning, and Community Right-to-Know Programs.

USEPA. 1980. Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), Public Law 96-510.

USEPA. 1993. Guidance on Conducting Non-Time Critical Removal Actions Under CERCLA. OSWER Publication 9360.0-32. EPA/540-R-93-057.

USEPA, Region III. April 2000. Updated Risk-Based Concentration Table (Eric W. Johnson, Chief).

Appendix A
ARAR Tables

Table A-1
Federal Location-Specific ARARs
SWMU 8 at NAB Little Creek

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comment
Executive Order 11988, Protection of Floodplain*					
Within floodplain	Actions taken should avoid adverse effects, minimize potential harm, restore and preserve natural and beneficial values.	Action that will occur in a floodplain, i.e., lowlands, and relatively flat areas adjoining inland and coastal waters and other flood-prone areas.	40 CFR Part 6, Appendix A; excluding Sections 6(a)(2), 6(a)(4), 6(a)(6); 40 CFR 6.302	Not Applicable.	SWMU 8 is not in a flood plain.
Executive Order 11990, Protection of Wetlands*					
Wetland	Action to minimize the destruction, loss, or degradation of wetlands.	Wetland as defined by Executive Order 11990 Section 7.	40 CFR 6, Appendix A; excluding Sections 6(a)(2), 6(a)(4), 6(a)(6); 40 CFR 6.302	Not Applicable.	No federal or state regulated wetlands are present at the site.
Clean Water Act, Section 404*					
Wetland	Action to prohibit discharge of dredged or fill material into wetland without permit.	Wetland as defined by Executive Order 11990 Section 7.	40 CFR 230.10; 40 CFR 231 (231.1, 231.2, 231.7, 231.8)	Not Applicable.	No discharge of dredged or fill material to a wetland is planned as part of the removal action.
Endangered Species Act of 1978*					
Endangered species	Action to ensure that any action is not likely to jeopardize the continued existence of endangered or threatened species or adversely affect its critical habitat.	Applies to actions that affect endangered or threatened species or their habitat.	16 USC 1531 50 CFR Part 402	Not Applicable.	Except for the occasional transient individuals, no federally listed or proposed endangered species are known to exist at SWMU 8. Therefore, the requirements of the Endangered Species Act of 1973 (16 USC 1536(a)) will not be applicable to removal action occurring at SWMU 8.

* Statutes and policies, and their citations are provided as headings to identify general categories of potential ARARs for the convenience of the reader. Listing the statutes and policies does not indicate that DON accepts the entire statues or policies as potential ARARs. Specific potential ARARs are addressed in the table below each general heading; only substantive requirements of the specific citations are considered potential ARARs.

ARARs – Applicable or relevant and appropriate requirements.
CFR - Code of Federal Regulations.
USC - United States Code.

Table A-2
Virginia Location-Specific ARARs
SWMU 8 at NAB Little Creek

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comment
Virginia State Water Control Laws and Virginia Wetlands Regulations*					
Wetland	Action to minimize the destruction, loss, or degradation of wetlands.	Wetland as defined by Virginia statutory provision.	Virginia Code Sections 62.1-44.15:5	Not Applicable	No federal and/or state regulated wetlands are present adjacent to the site which could be impacted by the removal action for the site.
Chesapeake Bay Preservation Act and Chesapeake Bay Preservation Area Designation and Management Regulations*					
Chesapeake Bay areas	Under these requirements, certain locally designated tidal and nontidal wetlands, as well as other sensitive land areas, may be subject to limitations regarding land-disturbing activities, removal of vegetation, use of impervious cover, erosion and sediment control, stormwater management, and other aspects of land use that may have effects on water quality.	Federally owned area designated as a Chesapeake Bay Preservation area.	Code of Virginia Section 10.1-2100 et seq. and 9 VAC 10-20-10	Not Applicable	This requirement is not an ARAR since the area affected by the removal action is not a federally owned Chesapeake Bay Preservation area.
Coastal Zone Management Act; NOAA Regulations of Federal Consistency with approved State Coastal Zone Management Programs					
Within coastal zone	Conduct activities within a coastal Management Zone in a manner consistent with local requirements.	Activities affecting the coastal zone including lands thereunder and adjacent shore land.	Section 307(c) of 16 USC 1456(c); also see 15 CFR 930 and 923.45	Not Applicable	This requirement is not an ARAR since neither the City of Norfolk nor the City of Virginia Beach has jurisdiction over the NAB Little Creek. Compliance is on a voluntary basis.
Virginia Endangered Species Act*					
Critical habitat upon which endangered species or threatened species depend.	Action to conserve endangered species or threatened species, including consultation with the Virginia Board of Game and Inland Fisheries.	Determination of effect upon endangered or threatened species or its habitat.	Code of Virginia Sections 29.1-563 through 568 4 VAC 15-20-130	Not Applicable	Except for occasional transient individuals, no federally listed or proposed endangered species are known to exist at SWMU 8. Therefore, the requirements of the Endangered Species Act of 1973 (16 USC 1536(a)) will not be applicable to removal action occurring at SWMU 8.

Table A-2
Virginia Location-Specific ARARs
SWMU 8 at NAB Little Creek

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comment
Virginia Natural Areas Preserves Act*					
Natural preserves area	Action to conserve natural preserve areas and restrict certain activities in these areas	Applicable to sites that meet natural preserve area criteria as determined by the Virginia Department of Conservation and Recreation	Code of Virginia Sections 10.1-209 through 217	Not Applicable	SWMU 8 is not a natural preserve area.
Virginia Endangered Plant and Insect Species Act; Virginia Board of Game and Inland Fisheries*					
Endangered plant and insect species	Action to conserve endangered or protected plant and insect species	Applies to actions that affect endangered or protected plant and insect species.	Code of Virginia Sections 29.1-100 and 29.1-565 2 VAC 5-320-10	Relevant and Appropriate	Virginia Department of Agriculture and Consumer Services will be notified of this project. The Navy requests determination if proposed activities will affect endangered plants or insects.

* Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs for the convenience of the reader. Listing the statutes and policies does not indicate that Navy accepts the entire statutes or policies as potential ARARs. Specific potential ARARs are addressed in the table below each general heading; only substantive requirements of the specific citations are considered potential ARARs.

ARARs- Applicable or relevant and appropriate requirements

Table A-3
Federal Chemical-Specific ARARs
SWMU 8 at NAB Little Creek

Requirement	Prerequisite	Citation	ARAR Determination	Comment
Soil				
Toxicity Characteristic Leaching Procedure (TCLP) regulatory levels	Hazardous waste treatment, storage, or disposal.	Title 22 CCR, 66261.24(a)	Applicable	Applicable for determining whether waste is hazardous
Definition of RCRA Hazardous Waste	Waste soil	40 CFR Sections 261.21, 261.22(a)(1); 261.23; 261.24(a)(1); and 261.100	Applicable	Applicable for determining whether waste is hazardous
Chemical-specific risk-based screening levels	CERCLA site	EPA Region III RBC	TBC	Risk-based concentrations to screen against site concentrations as a preliminary indicator of the presence of risk

* Statutes and policies, and their citations are provided as headings to identify general categories of potential ARARs for the convenience of the reader. Listing the statutes and policies does not indicate that DON accepts the entire statutes or policies as potential ARARs. Specific potential ARARs are addressed in the table below each general heading; only substantive requirements of the specific citations are considered potential ARARs.

ARARs-Applicable or relevant and appropriate requirements.

CFR- Code of Federal Regulations

USC- United States Code.

TBC- To Be Considered

Table A-4
Virginia Chemical-Specific ARARs
SWMU 8 at NAB Little Creek

Requirement	Prerequisite	Citation	ARAR Determination	Comment
Soil				
Virginia Solid Waste Management Regulations (VSWMRs)				
Specific regulations for the handling of "Special Wastes"	Waste must meet the determination of a Virginia "special waste"	VSWMR Part VIII	Applicable	Applicable if excavated ABM and soil meets the determination of a special waste due to the presence of TPH, BTEX, or PCBs

*Statutes and policies, and their citations are provided as headings to identify general categories of potential ARARs for the convenience of the reader. Listing the statutes and policies does not indicate that Navy accepts the entire statutes or policies as potential ARARs. Specific potential ARARs are addressed in the table below each general heading; only substantive requirements of the specific citations are considered potential ARARs.

ARARs - Applicable or relevant and appropriate requirements.
CFR - Code of Federal Regulations.
USC - United States Code.
TBC - To be considered criterion, not an ARAR

Table A-5
Federal Action-Specific ARARs
SWMU 8 at NAB Little Creek

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comment
RCRA Subtitle D*					
Offsite Disposal	Provides criteria for determining if solid waste disposal facility poses an adverse effect on human health or environment.	Permitted solid waste landfill.	40 CFR Part 257	Applicable.	TBC for determining suitable off-site disposal facilities if required for excavation and disposal of material beyond boundaries of the landfill cap.
Off-site Disposal	Provides criteria for determining if municipal solid waste disposal facility poses an adverse effect on human health or environment.	Permitted municipal solid waste landfill.	40 CFR Part 258	Applicable.	TBC for determining suitable off-site disposal facilities.
Clean Air Act (CAA) 40 USC 7401 et seq.*					
Discharge to air	National Primary and Secondary Ambient Air Quality Standards (NAAQS) - standards for ambient air quality to protect public health and welfare (including standards for particulate matter and lead).	Contamination of air affecting public health and welfare	40 CFR Sections 50.4 - 50.12	Not Applicable.	Not an ARAR; Federal NAAQS are nonenforceable standards. May be a TBC for site remediation activities.

* Statutes and policies, and their citations are provided as headings to identify general categories of ARARs. Specific potential ARARs are addressed in the table below each general heading.

*** A-Applicable, PR- Relevant and appropriate, TBC- To Be Considered*

CFR- Code of Federal Regulations

USC- United States Code

NAAQS- national Ambient Air Quality Standards (primary and secondary)

Table A-6
Virginia Action-Specific ARARs
SWMU 8 at NAB Little Creek

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comment
Virginia Air Pollution Control Regulations*					
Discharge to air	Virginia Ambient Air Quality Standards - standards for ambient air quality to protect public health and welfare (including standards for particulate matter and lead).	Contamination of air affecting public health and welfare.	VR 120-03-02, VR-120-030-06 & 9 VAC 5-30-10	Applicable.	Applicable for all site remediation activities that may generate air discharges.
Discharge of visible emissions and fugitive dust	Fugitive dust/emissions may not be discharged to the atmosphere at amounts in excess of standards.	Any source of fugitive dust/ emissions.	VR 120-05-01 & VAC 5-50-60 to 120	Applicable.	Applicable for any site remediation activities that generate fugitive dust.
Discharge of toxic pollutants	Toxic pollutants may not be discharged to the atmosphere at amounts in excess of standards.	Any emission from the disturbance of soil, or treatment of soil or water, that do not qualify for the exemptions under Rule 4-3.	VR 120-05-01& VAC 5-50-160 to 230	Applicable.	Applicable for any site remediation activities that generate toxic air pollutants.
Virginia Stormwater Management Regulations and Virginia Erosion and Sediment Control Regulations					
Stormwater Management	Regulates stormwater management and erosion/ sedimentation control practice.	Land disturbing activities.	VR 215-02-00 & VR 625-02-00 & 4 VAC 50–30-10	Applicable.	Applicable for any site remediation activities involving surface water runoff and erosion.

Table A-6
Virginia Action-Specific ARARs
SWMU 8 at NAB Little Creek

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comment
Solid Waste Management Regulations, Solid Waste Disposal Facility Standards (9 VAC 20-80); Virginia Waste Management Act*					
Solid Waste Staging Transport, and Disposal	These regulations and laws define the requirements for the management of solid wastes. Any disposal facility must be properly permitted and in compliance with all operational and monitoring requirements of the permit and regulations.	Wastes must meet definition of solid waste.	VR 672-20-10, Part V; 9 VAC 20-80	Relevant and Appropriate.	Applicable to management and staging, transportation, and off-site disposal of any soil and ABM classified as a solid waste.

* Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs. Specific ARARs are addressed in the table below each general heading.

**Applicable, RA- Relevant and appropriate, TBC- To Be Considered

ARAR- Applicable or relevant and appropriate requirement

CFR- Code of Federal Regulations USC- United States Code

Appendix B
Detailed Cost Estimates

Worker Protection Level	D
Labor Efficiency	100%
Equipment Efficiency	100%
Material Efficiency	100%

DESCRIPTION	ESTIMATED QUANTITY	UNIT	LABOR UNIT	EQUIP UNIT	MAT'L UNIT	ADJUSTED LABOR UNIT	ADJUSTED EQUIP UNIT	ADJUSTED MAT'L UNIT	LABOR TOTAL	EQUIP UNIT	MAT'L TOTAL	TOTAL	Source
SITE PREPARATION													
Deliver/Dump Stone for Haul Roads	200	CY	$ 0.46	$ 0.90	$ 22.11	$ 0.46	$ 0.90	$ 22.11	$ 92.00	$ 180.00	$ 4,422.00	$ 4,694.00	ECHOS Item 17 03 0418
Spread/Compact Gravel Roads	30	CY	$ 1.59	$ 4.55	$ 0.29	$ 1.59	$ 4.55	$ 0.29	$ 47.70	$ 136.50	$ 8.70	$ 192.90	ECHOS Item 17 03 0422
Filter Barrier	2140	LF	$ 1.21	$ -	$ 0.60	$ 1.21	$ -	$ 0.60	$ 2,589.40	$ -	$ 1,284.00	$ 3,873.40	ECHOS Item 18 05 0206
Super Silt Fence	600	LF	$ 1.21	$ -	$ 2.00	$ 1.21	$ -	$ 2.00	$ 726.00	$ -	$ 1,200.00	$ 1,926.00	Engineer's Estimate
Geotextile Non woven 10.oz	10500	SF	$ 0.14	$ -	$ 0.65	$ 0.14	$ -	$ 0.65	$ 1,470.00	$ -	$ 6,825.00	$ 8,295.00	R.S. Means 2340 500 1550
EXCAVATION AND BACKFILL													
4 cy Crawler Mounted Excavator (Direct Load)	45	HR	$ 29.90	$ 237.07	$ -	$ 29.90	$ 237.07	$ -	$ 1,345.50	$ 10,668.15	$ -	$ 12,013.65	ECHOS Item 17 03 0234
Unclassified Fill, 6" Lifts, Offsite (incl. Compaction)	1800	CY	$ 0.86	$ 1.98	$ 5.06	$ 0.86	$ 1.98	$ 5.06	$ 1,548.00	$ 3,564.00	$ 9,108.00	$ 14,220.00	ECHOS Item 17 03 0423
Decontamination (heavy equipment)	4	EA	$ 239.48	$ -	$ -	$ 239.48	$ -	$ -	$ 957.92	$ -	$ -	$ 957.92	ECHOS Item 33 17 0803
WASTE MANAGEMENT/TRANSPORTATION													
Transportation (of Nonhazardous Waste)													
Transportation of Non-Hazardous Waste by Dump Truck (Local)	155	HOUR	$ 23.00	$ 45.00	$ -	$ 23.00	$ 45.00	$ -	$ 3,565.00	$ 6,975.00	$ -	$ 10,540.00	Engineer's Estimate
Off-Site Disposal (as Nonhazardous Waste)													
Solid Waste Disposal at Subtitle D Landfill	2880	TON	$ -	$ -	$ -	$ -	$ -	$ 35.00	$ -	$ -	$ 100,800.00	$ 100,800.00	Verbal Quote from SPSA
DISPOSAL/CONFIRMATORY TESTING AND ANALYSIS													
Sample Technician	8	HOUR	$ 110.00	$ -	$ -	$ 110.00	$ -	$ -	$ 880.00	$ -	$ -	$ 880.00	ECHOS Item 99 01 06
Soil Sampling Equipment and Supplies	5	DAY	$ -	$ 250.00	$ -	$ -	$ 250.00	$ -	$ -	$ 1,250.00	$ -	$ 1,250.00	Engineer's Estimate
Total Lead, 48-Hour Turnaround (ICP, individual element 6010B)	4	EA	$ -	$ -	$ 35.00	$ -	$ -	$ 35.00	$ -	$ -	$ 140.00	$ 140.00	ECHOS Item 33 02 1705
TAL Metals	20	EA	$ -	$ -	$ 144.00	$ -	$ -	$ 144.00	$ -	$ -	$ 2,880.00	$ 2,880.00	ECHOS Item 33 02 1709
PAHs (SW 846 8270 SIM)	20	EA	$ -	$ -	$ 267.00	$ -	$ -	$ 267.00	$ -	$ -	$ 5,340.00	$ 5,340.00	ECHOS Item 33 02 1715
Full TAL Metals (including cyanide)	5	EA	$ -	$ -	$ 165.00	$ -	$ -	$ 165.00	$ -	$ -	$ 825.00	$ 825.00	ECHOS Item 33 02 1732
TCL Organics	5	EA	$ -	$ -	$ 128.00	$ -	$ -	$ 128.00	$ -	$ -	$ 640.00	$ 640.00	ECHOS Item 33 02 1732
Sample Shipping	2	EA	$ -	$ -	$ 75.00	$ -	$ -	$ 75.00	$ -	$ -	$ 150.00	$ 150.00	Engineer's Estimate
Prepare Closeout Report	1	LS	$ 5,000.00	$ -	$ -	$ 5,000.00	$ -	$ -	$ 5,000.00	$ -	$ -	$ 5,000.00	Engineer's Estimate
SITE RESTORATION													
Stone for Road Restoration	150	CY	$ 0.46	$ 0.90	$ 22.11	$ 0.46	$ 0.90	$ 22.11	$ 69.00	$ 135.00	$ 3,316.50	$ 3,520.50	ECHOS Item 17 03 0418
Topsoil, 6" Lifts, Off-site	1900	CY	$ 3.48	$ 3.63	$ 12.35	$ 3.48	$ 3.63	$ 12.35	$ 6,612.00	$ 6,897.00	$ 23,465.00	$ 36,974.00	ECHOS 18 05 0301
Seeding	3	ACRE	$ 64.10	$ 88.11	$ 325.70	$ 64.10	$ 88.11	$ 325.70	$ 192.30	$ 264.33	$ 977.10	$ 1,433.73	ECHOS 18 05 0401
Mulching	3	ACRE	$ 29.32	$ 22.53	$ 1,377.00	$ 29.32	$ 22.53	$ 1,377.00	$ 87.96	$ 67.59	$ 4,131.00	$ 4,286.55	Means Item 02830 2005
Rock Cover, Riprap, Medium	150	CY	$ 3.00	$ 2.38	$ 15.41	$ 3.00	$ 2.38	$ 15.41	$ 450.00	$ 357.00	$ 2,311.50	$ 3,118.50	ECHOS Item 10 05 0203
OVERSIGHT AND REPORTING (Distributive Costs)													
Superintendent	3	WEEK	$ 1,283.00	$ -	$ -	$ 1,283.00	$ -	$ -	$ 3,849.00	$ -	$ -	$ 3,849.00	ECHOS Item 99 01 0102
Project Engineer/QC Engineer (Double Hat)	3	WEEK	$ 839.66	$ -	$ -	$ 839.66	$ -	$ -	$ 2,518.98	$ -	$ -	$ 2,518.98	ECHOS Item 99 01 0104
Clerk	3	WEEK	$ 267.80	$ -	$ -	$ 267.80	$ -	$ -	$ 803.40	$ -	$ -	$ 803.40	ECHOS Item 99 01 0103
Field Office (and related costs)	2	MONTH	$ -	$ -	$ 1,000.00	$ -	$ -	$ 1,000.00	$ -	$ -	$ 2,000.00	$ 2,000.00	Engineer's Estimate
Per Diem	75	DAY	$ -	$ -	$ 147.00	$ -	$ -	$ 147.00	$ -	$ -	$ 11,025.00	$ 11,025.00	Engineer's Estimate
Continuous Cleanup	3	WEEK	$ 890.00	$ -	$ -	$ 890.00	$ -	$ -	$ 2,670.00	$ -	$ -	$ 2,670.00	Engineer's Estimate
Subtotal									**$ 35,474.16**	**$ 30,494.57**	**$ 180,848.80**	**$ 246,817.53**	
Location Multiplier												81%	ECHOS Localization Factors
Adjusted Cost												**$ 199,922.20**	
Mobilization/Demobilization											10%	$ 19,992.22	
Design											3%	$ 5,997.67	
Overhead											40%	$ 79,968.88	
Profit											10%	$ 19,992.22	
Contingency											20%	$ 39,984.44	
Total Alternative Cost												**$ 365,857.62**	

Worker Protection Level	D
Labor Efficiency	100%
Equipment Efficiency	100%
Material Efficiency	100%

DESCRIPTION	ESTIMATED QUANTITY	UNIT	LABOR UNIT	EQUIP UNIT	MAT'L UNIT	ADJUSTED LABOR UNIT	ADJUSTED EQUIP UNIT	ADJUSTED MAT'L UNIT	LABOR TOTAL	EQUIP TOTAL	MAT'L TOTAL	TOTAL	Source
SITE PREPARATION													
Deliver/Dump Stone for Haul Roads	200	CY	$ 0.46	$ 0.90	$ 22.11	$ 0.46	$ 0.90	$ 22.11	$ 92.00	$ 180.00	$ 4,422.00	$ 4,694.00	ECHOS Item 17 03 0418
Spread/Compact Gravel Roads	30	CY	$ 1.59	$ 4.55	$ 0.29	$ 1.59	$ 4.55	$ 0.29	$ 47.70	$ 136.50	$ 8.70	$ 192.90	ECHOS Item 17 03 0422
Filter Barrier	2140	LF	$ 1.21	$ -	$ 0.60	$ 1.21	$ -	$ 0.60	$ 2,589.40	$ -	$ 1,284.00	$ 3,873.40	ECHOS Item 18 05 0206
Super Silt Fence	600	LF	$ 1.21	$ -	$ 2.00	$ 1.21	$ -	$ 2.00	$ 726.00	$ -	$ 1,200.00	$ 1,926.00	Engineer's Estimate
Geotextile Non woven 10.oz	10500	SF	$ 0.14	$ -	$ 0.65	$ 0.14	$ -	$ 0.65	$ 1,470.00	$ -	$ 6,825.00	$ 8,295.00	R.S. Means 2340 500 1550
EXCAVATION AND BACKFILL													
4 cy Crawler Mounted Excavator (Direct Load)	45	HR	$ 29.90	$ 237.07	$ -	$ 29.90	$ 237.07	$ -	$ 1,345.50	$ 10,668.15	$ -	$ 12,013.65	ECHOS Item 17 03 0234
Unclassified Fill, 6" Lifts, Offsite (incl. Compaction)	1800	CY	$ 0.86	$ 1.98	$ 5.06	$ 0.86	$ 1.98	$ 5.06	$ 1,548.00	$ 3,564.00	$ 9,108.00	$ 14,220.00	ECHOS Item 17 03 0423
Decontamination (heavy equipment)	4	EA	$ 239.48	$ -	$ -	$ 239.48	$ -	$ -	$ 957.92	$ -	$ -	$ 957.92	ECHOS Item 33 17 0803
WASTE MANAGEMENT/TRANSPORTATION													
Transportation (of Hazardous Waste)													
Dump Truck Transport, Hazardous Waste (300-399 mi)	7775	MILE	$ -	$ -	$ 2.28	$ -	$ -	$ 2.28	$ -	$ -	$ 17,727.00	$ 17,727.00	ECHOS Item 33 19 0212
Off-Site Disposal (as Hazardous Waste)													
Solid Waste Disposal at Subtitle C Landfill (Requires Stabilization)	725	TON	$ -	$ -	$ 150.00	$ -	$ -	$ 150.00	$ -	$ -	$ 108,750.00	$ 108,750.00	Engineer's Estimate
Transportation (of Nonhazardous Waste)													
Transportation of Non-Hazardous Waste by Dump Truck (Local)	115	HOUR	$ 23.00	$ 45.00	$ -	$ 23.00	$ 45.00	$ -	$ 2,645.00	$ 5,175.00	$ -	$ 7,820.00	Engineer's Estimate
Off-Site Disposal (as Nonhazardous Waste)													
Solid Waste Disposal at Subtitle D Landfill	2175	TON	$ -	$ -	$ -	$ -	$ -	$ 35.00	$ -	$ -	$ 76,125.00	$ 76,125.00	Verbal Quote from SPSA
DISPOSAL/CONFIRMATORY TESTING AND ANALYSIS													
Sample Technician	8	HOUR	$ 110.00	$ -	$ -	$ 110.00	$ -	$ -	$ 880.00	$ -	$ -	$ 880.00	ECHOS Item 99 01 06
Soil Sampling Equipment and Supplies	5	DAY	$ -	$ 250.00	$ -	$ -	$ 250.00	$ -	$ -	$ 1,250.00	$ -	$ 1,250.00	Engineer's Estimate
Total Lead, 48-Hour Turnaround (ICP, individual element 6010B)	4	EA	$ -	$ -	$ 35.00	$ -	$ -	$ 35.00	$ -	$ -	$ 140.00	$ 140.00	ECHOS Item 33 02 1705
TAL Metals	20	EA	$ -	$ -	$ 144.00	$ -	$ -	$ 144.00	$ -	$ -	$ 2,880.00	$ 2,880.00	ECHOS Item 33 02 1709
PAHs (SW 846 8270 SIM)	20	EA	$ -	$ -	$ 267.00	$ -	$ -	$ 267.00	$ -	$ -	$ 5,340.00	$ 5,340.00	ECHOS Item 33 02 1715
Full TAL Metals (including cyanide)	5	EA	$ -	$ -	$ 165.00	$ -	$ -	$ 165.00	$ -	$ -	$ 825.00	$ 825.00	ECHOS Item 33 02 1732
TCL Organics	5	EA	$ -	$ -	$ 128.00	$ -	$ -	$ 128.00	$ -	$ -	$ 640.00	$ 640.00	ECHOS Item 33 02 1732
Sample Shipping	2	EA	$ -	$ -	$ 75.00	$ -	$ -	$ 75.00	$ -	$ -	$ 150.00	$ 150.00	Engineer's Estimate
Prepare Closeout Report	1	LS	$ 5,000.00	$ -	$ -	$ 5,000.00	$ -	$ -	$ 5,000.00	$ -	$ -	$ 5,000.00	Engineer's Estimate
SITE RESTORATION													
Stone/gravel for Road Restoration	150	CY	$ 0.46	$ 0.90	$ 22.11	$ 0.46	$ 0.90	$ 22.11	$ 69.00	$ 135.00	$ 3,316.50	$ 3,520.50	ECHOS Item 17 03 0418
Topsoil, 6" Lifts, Off-site	1900	CY	$ 3.48	$ 3.63	$ 12.35	$ 3.48	$ 3.63	$ 12.35	$ 6,612.00	$ 6,897.00	$ 23,465.00	$ 36,974.00	ECHOS 18 05 0301
Seeding	3	ACRE	$ 64.10	$ 88.11	$ 325.70	$ 64.10	$ 88.11	$ 325.70	$ 192.30	$ 264.33	$ 977.10	$ 1,433.73	ECHOS 18 05 0401
Mulching	3	ACRE	$ 29.32	$ 22.53	$ 1,377.00	$ 29.32	$ 22.53	$ 1,377.00	$ 87.96	$ 67.59	$ 4,131.00	$ 4,286.55	Means Item 02830 2005
Rock Cover, Riprap, Medium	150	CY	$ 3.00	$ 2.38	$ 15.41	$ 3.00	$ 2.38	$ 15.41	$ 450.00	$ 357.00	$ 2,311.50	$ 3,118.50	ECHOS Item 10 05 0203
OVERSIGHT AND REPORTING (Distributive Costs)													
Superintendent	3	WEEK	$ 1,283.00	$ -	$ -	$ 1,283.00	$ -	$ -	$ 3,849.00	$ -	$ -	$ 3,849.00	ECHOS Item 99 01 0102
Project Engineer/QC Engineer (Double Hat)	3	WEEK	$ 839.66	$ -	$ -	$ 839.66	$ -	$ -	$ 2,518.98	$ -	$ -	$ 2,518.98	ECHOS Item 99 01 0104
Clerk	3	WEEK	$ 267.80	$ -	$ -	$ 267.80	$ -	$ -	$ 803.40	$ -	$ -	$ 803.40	ECHOS Item 99 01 0103
Field Office (and related costs)	2	MONTH	$ -	$ -	$ 1,000.00	$ -	$ -	$ 1,000.00	$ -	$ -	$ 2,000.00	$ 2,000.00	Engineer's Estimate
Per Diem	75	DAY	$ -	$ -	$ 147.00	$ -	$ -	$ 147.00	$ -	$ -	$ 11,025.00	$ 11,025.00	Engineer's Estimate
Continuous Cleanup	3	WEEK	$ 890.00	$ -	$ -	$ 890.00	$ -	$ -	$ 2,670.00	$ -	$ -	$ 2,670.00	Engineer's Estimate
Subtotal									**$ 34,554.16**	**$ 28,694.57**	**$ 282,650.80**	**$ 345,899.53**	
Location Multiplier												81%	ECHOS Localization Factors
Adjusted Cost												**$ 280,178.62**	
Mobilization/Demobilization											10%	$ 28,017.86	
Design											3%	$ 8,405.36	
Overhead											40%	$ 112,071.45	
Profit											10%	$ 28,017.86	
Contingency											20%	$ 56,035.72	
Total Alternative Cost												**$ 512,726.87**	

Worker Protection Level	D
Labor Efficiency	100%
Equipment Efficiency	100%
Material Efficiency	100%

DESCRIPTION	ESTIMATED QUANTITY	UNIT	LABOR UNIT	EQUIP UNIT	MAT'L UNIT	ADJUSTED LABOR UNIT	ADJUSTED EQUIP UNIT	ADJUSTED MAT'L UNIT	LABOR TOTAL	EQUIP UNIT	MAT'L TOTAL	TOTAL	Source

1. Analysis for Alternative 1B assumes 25% of the excavated material is classified as hazardous (requiring Subtitle C landfill disposal), 75% is nonhazardous and can be disposed of locally, for cost estimating purposes.

Worker Protection Level	D
Labor Efficiency	100%
Equipment Efficiency	100%
Material Efficiency	100%

DESCRIPTION	ESTIMATED QUANTITY	UNIT	LABOR UNIT	EQUIP UNIT	MAT'L UNIT	ADJUSTED LABOR UNIT	ADJUSTED EQUIP UNIT	ADJUSTED MAT'L UNIT	LABOR TOTAL	EQUIP TOTAL	MAT'L TOTAL	TOTAL	Source
SITE PREPARATION													
Deliver/Dump Stone for Haul Roads	200	CY	$ 0.46	$ 0.90	$ 22.11	$ 0.46	$ 0.90	$ 22.11	$ 92.00	$ 180.00	$ 4,422.00	$ 4,694.00	ECHOS Item 17 03 0418
Spread/Compact Gravel Roads	30	CY	$ 1.59	$ 4.55	$ 0.29	$ 1.59	$ 4.55	$ 0.29	$ 47.70	$ 136.50	$ 8.70	$ 192.90	ECHOS Item 17 03 0422
Filter Barrier	2140	LF	$ 1.21	$ -	$ 0.60	$ 1.21	$ -	$ 0.60	$ 2,589.40	$ -	$ 1,284.00	$ 3,873.40	ECHOS Item 18 05 0206
Super Silt Fence	600	LF	$ 1.21	$ -	$ 2.00	$ 1.21	$ -	$ 2.00	$ 726.00	$ -	$ 1,200.00	$ 1,926.00	Engineer's Estimate
Geotextile Non woven 10.oz	10500	SF	$ 0.14	$ -	$ 0.65	$ 0.14	$ -	$ 0.65	$ 1,470.00	$ -	$ 6,825.00	$ 8,295.00	R.S. Means 2340 500 1550
EXCAVATION AND BACKFILL													
4 cy Crawler Mounted Excavator (Direct Load)	50	HR	$ 29.90	$ 237.07	$ -	$ 29.90	$ 237.07	$ -	$ 1,495.00	$ 11,853.50	$ -	$ 13,348.50	ECHOS Item 17 03 0234
Unclassified Fill, 6" Lifts, Offsite (incl. Compaction)	2200	CY	$ 0.86	$ 1.98	$ 5.06	$ 0.86	$ 1.98	$ 5.06	$ 1,892.00	$ 4,356.00	$ 11,132.00	$ 17,380.00	ECHOS Item 17 03 0423
Decontamination (heavy equipment)	4	EA	$ 239.48	$ -	$ -	$ 239.48	$ -	$ -	$ 957.92	$ -	$ -	$ 957.92	ECHOS Item 33 17 0803
WASTE MANAGEMENT/TRANSPORTATION													
Transportation (of Nonhazardous Waste)													
Transportation of Non-Hazardous Waste by Dump Truck (Local)	200	HOUR	$ 23.00	$ 45.00	$ -	$ 23.00	$ 45.00	$ -	$ 4,600.00	$ 9,000.00	$ -	$ 13,600.00	Engineer's Estimate
Off-Site Disposal (as Nonhazardous Waste)													
Solid Waste Disposal at Subtitle D Landfill	3500	TON	$ -	$ -	$ -	$ -	$ -	$ 35.00	$ -	$ -	$ 122,500.00	$ 122,500.00	Verbal Quote from SPSA
CONFIRMATION FIELD TESTING													
XRF Instrumentation and Operation	5	DAY	$ 1,000.00	$ -	$ -	$ 1,000.00	$ -	$ -	$ 5,000.00	$ -	$ -	$ 5,000.00	Verbal Quote from SPSA
Operator Travel Costs	1	WEEK	$ 500.00	$ -	$ -	$ 500.00	$ -	$ -	$ 500.00	$ -	$ -	$ 500.00	Verbal Quote from SPSA
DISPOSAL/CONFIRMATORY TESTING AND ANALYSIS													
Sample Technician	8	HOUR	$ 110.00	$ -	$ -	$ 110.00	$ -	$ -	$ 880.00	$ -	$ -	$ 880.00	ECHOS Item 99 01 06
Soil Sampling Equipment and Supplies	5	DAY	$ -	$ 250.00	$ -	$ -	$ 250.00	$ -	$ -	$ 1,250.00	$ -	$ 1,250.00	Engineer's Estimate
Total Lead, 48-Hour Turnaround (ICP, individual element 6010B)	4	EA	$ -	$ -	$ 35.00	$ -	$ -	$ 35.00	$ -	$ -	$ 140.00	$ 140.00	ECHOS Item 33 02 1705
TAL Metals	20	EA	$ -	$ -	$ 144.00	$ -	$ -	$ 144.00	$ -	$ -	$ 2,880.00	$ 2,880.00	ECHOS Item 33 02 1709
PAHs (SW 846 8270 SIM)	20	EA	$ -	$ -	$ 267.00	$ -	$ -	$ 267.00	$ -	$ -	$ 5,340.00	$ 5,340.00	ECHOS Item 33 02 1715
Full TAL Metals (including cyanide)	5	EA	$ -	$ -	$ 165.00	$ -	$ -	$ 165.00	$ -	$ -	$ 825.00	$ 825.00	ECHOS Item 33 02 1732
TCL Organics	5	EA	$ -	$ -	$ 128.00	$ -	$ -	$ 128.00	$ -	$ -	$ 640.00	$ 640.00	ECHOS Item 33 02 1732
Sample Shipping	3	EA	$ -	$ -	$ 75.00	$ -	$ -	$ 75.00	$ -	$ -	$ 225.00	$ 225.00	Engineer's Estimate
Prepare Closeout Report	1	LS	$ 5,000.00	$ -	$ -	$ 5,000.00	$ -	$ -	$ 5,000.00	$ -	$ -	$ 5,000.00	Engineer's Estimate
SITE RESTORATION													
Stone for Road Restoration	150	CY	$ 0.46	$ 0.90	$ 22.11	$ 0.46	$ 0.90	$ 22.11	$ 69.00	$ 135.00	$ 3,316.50	$ 3,520.50	ECHOS Item 17 03 0418
Topsoil, 6" Lifts, Off-site	1900	CY	$ 3.48	$ 3.63	$ 12.35	$ 3.48	$ 3.63	$ 12.35	$ 6,612.00	$ 6,897.00	$ 23,465.00	$ 36,974.00	ECHOS 18 05 0301
Seeding	2.6	ACRE	$ 64.10	$ 88.11	$ 325.70	$ 64.10	$ 88.11	$ 325.70	$ 166.66	$ 229.09	$ 846.82	$ 1,242.57	ECHOS 18 05 0401
Mulching	2.6	ACRE	$ 29.32	$ 22.53	$ 1,377.00	$ 29.32	$ 22.53	$ 1,377.00	$ 76.23	$ 58.58	$ 3,580.20	$ 3,715.01	Means Item 02830 2005
Rock Cover, Riprap, Medium	150	CY	$ 3.00	$ 2.38	$ 15.41	$ 3.00	$ 2.38	$ 15.41	$ 450.00	$ 357.00	$ 2,311.50	$ 3,118.50	ECHOS Item 10 05 0203
OVERSIGHT AND REPORTING (Distributive Costs)													
Superintendent	4	WEEK	$ 1,283.00	$ -	$ -	$ 1,283.00	$ -	$ -	$ 5,132.00	$ -	$ -	$ 5,132.00	ECHOS Item 99 01 0102
Project Engineer/QC Engineer (Double Hat)	4	WEEK	$ 839.66	$ -	$ -	$ 839.66	$ -	$ -	$ 3,358.64	$ -	$ -	$ 3,358.64	ECHOS Item 99 01 0104
Clerk	4	WEEK	$ 267.80	$ -	$ -	$ 267.80	$ -	$ -	$ 1,071.20	$ -	$ -	$ 1,071.20	ECHOS Item 99 01 0103
Field Office (and related costs)	2	MONTH	$ -	$ -	$ 1,000.00	$ -	$ -	$ 1,000.00	$ -	$ -	$ 2,000.00	$ 2,000.00	Engineer's Estimate
Per Diem	100	DAY	$ -	$ -	$ 147.00	$ -	$ -	$ 147.00	$ -	$ -	$ 14,700.00	$ 14,700.00	Engineer's Estimate
Continuous Cleanup	4	WEEK	$ 890.00	$ -	$ -	$ 890.00	$ -	$ -	$ 3,560.00	$ -	$ -	$ 3,560.00	Engineer's Estimate
Subtotal									**$ 45,745.75**	**$ 34,452.66**	**$ 207,641.72**	**$ 287,840.14**	
Location Multiplier												81%	ECHOS Localization Factors
Adjusted Cost												**$ 233,150.51**	
Mobilization/Demobilization											10%	$ 23,315.05	
Design											3%	$ 6,994.52	
Overhead											40%	$ 93,260.20	
Profit											10%	$ 23,315.05	
Contingency											20%	$ 46,630.10	
Total Alternative Cost												**$ 426,665.43**	

Worker Protection Level	D
Labor Efficiency	100%
Equipment Efficiency	100%
Material Efficiency	100%

DESCRIPTION	ESTIMATED QUANTITY	UNIT	LABOR UNIT	EQUIP UNIT	MAT'L UNIT	ADJUSTED LABOR UNIT	ADJUSTED EQUIP UNIT	ADJUSTED MAT'L UNIT	LABOR TOTAL	EQUIP TOTAL	MAT'L TOTAL	TOTAL	Source
SITE PREPARATION													
Deliver/Dump Stone for Haul Roads	200	CY	$ 0.46	$ 0.90	$ 22.11	$ 0.46	$ 0.90	$ 22.11	$ 92.00	$ 180.00	$ 4,422.00	$ 4,694.00	ECHOS Item 17 03 0418
Spread/Compact Gravel Roads	30	CY	$ 1.59	$ 4.55	$ 0.29	$ 1.59	$ 4.55	$ 0.29	$ 47.70	$ 136.50	$ 8.70	$ 192.90	ECHOS Item 17 03 0422
Filter Barrier	2140	LF	$ 1.21	$ -	$ 0.60	$ 1.21	$ -	$ 0.60	$ 2,589.40	$ -	$ 1,284.00	$ 3,873.40	ECHOS Item 18 05 0206
Super Silt Fence	600	LF	$ 1.21	$ -	$ 2.00	$ 1.21	$ -	$ 2.00	$ 726.00	$ -	$ 1,200.00	$ 1,926.00	Engineer's Estimate
Geotextile Non woven 10.oz	10500	SF	$ 0.14	$ -	$ 0.65	$ 0.14	$ -	$ 0.65	$ 1,470.00	$ -	$ 6,825.00	$ 8,295.00	R.S. Means 2340 500 1550
EXCAVATION AND BACKFILL													
4 cy Crawler Mounted Excavator (Direct Load)	50	HR	$ 29.90	$ 237.07	$ -	$ 29.90	$ 237.07	$ -	$ 1,495.00	$ 11,853.50	$ -	$ 13,348.50	ECHOS Item 17 03 0234
Unclassified Fill, 6" Lifts, Offsite (incl. Compaction)	2200	CY	$ 0.86	$ 1.98	$ 5.06	$ 0.86	$ 1.98	$ 5.06	$ 1,892.00	$ 4,356.00	$ 11,132.00	$ 17,380.00	ECHOS Item 17 03 0423
Decontamination (heavy equipment)	4	EA	$ 239.48	$ -	$ -	$ 239.48	$ -	$ -	$ 957.92	$ -	$ -	$ 957.92	ECHOS Item 33 17 0803
WASTE MANAGEMENT/TRANSPORTATION													
Transportation (of Hazardous Waste)													
Dump Truck Transport, Hazardous Waste (300-399 mi)	4000	MI	$ -	$ -	$ 2.28	$ -	$ -	$ 2.28	$ -	$ -	$ 9,120.00	$ 9,120.00	ECHOS Item 33 19 0212
Off-Site Disposal (as Hazardous Waste)													
Solid Waste Disposal at Subtitle C Landfill (Requires Stabilization)	600	TON	$ -	$ -	$ 150.00	$ -	$ -	$ 150.00	$ -	$ -	$ 90,000.00	$ 90,000.00	Engineer's Estimate
Transportation (of Nonhazardous Waste)													
Transportation of Non-Hazardous Waste by Dump Truck (Local)	150	HOUR	$ 23.00	$ 45.00	$ -	$ 23.00	$ 45.00	$ -	$ 3,450.00	$ 6,750.00	$ -	$ 10,200.00	Engineer's Estimate
Off-Site Disposal (as Nonhazardous Waste)													
Solid Waste Disposal at Subtitle D Landfill	2900	TON	$ -	$ -	$ -	$ -	$ -	$ 35.00	$ -	$ -	$ 101,500.00	$ 101,500.00	Verbal Quote from SPSA
CONFIRMATION FIELD TESTING													
XRF Instrumentation and Operation	5	DAY	$ 1,000.00	$ -	$ -	$ 1,000.00	$ -	$ -	$ 5,000.00	$ -	$ -	$ 5,000.00	Verbal Quote from SPSA
Operator Travel Costs	1	WEEK	$ 500.00	$ -	$ -	$ 500.00	$ -	$ -	$ 500.00	$ -	$ -	$ 500.00	Verbal Quote from SPSA
DISPOSAL AND CONFIRMATORY TESTING AND ANALYSIS													
Sample Technician	8	HOUR	$ 110.00	$ -	$ -	$ 110.00	$ -	$ -	$ 880.00	$ -	$ -	$ 880.00	ECHOS Item 99 01 06
Soil Sampling Equipment and Supplies	5	DAY	$ -	$ 250.00	$ -	$ -	$ 250.00	$ -	$ -	$ 1,250.00	$ -	$ 1,250.00	Engineer's Estimate
Total Lead, 48-Hour Turnaround (ICP, individual element 6010B)	4	EA	$ -	$ -	$ 35.00	$ -	$ -	$ 35.00	$ -	$ -	$ 140.00	$ 140.00	ECHOS Item 33 02 1705
TAL Metals	20	EA	$ -	$ -	$ 144.00	$ -	$ -	$ 144.00	$ -	$ -	$ 2,880.00	$ 2,880.00	ECHOS Item 33 02 1709
PAHs (SW 846 8270 SIM)	20	EA	$ -	$ -	$ 267.00	$ -	$ -	$ 267.00	$ -	$ -	$ 5,340.00	$ 5,340.00	ECHOS Item 33 02 1715
Full TAL Metals (including cyanide)	5	EA	$ -	$ -	$ 165.00	$ -	$ -	$ 165.00	$ -	$ -	$ 825.00	$ 825.00	ECHOS Item 33 02 1732
TCL Organics	5	EA	$ -	$ -	$ 128.00	$ -	$ -	$ 128.00	$ -	$ -	$ 640.00	$ 640.00	ECHOS Item 33 02 1732
Sample Shipping	3	EA	$ -	$ -	$ 75.00	$ -	$ -	$ 75.00	$ -	$ -	$ 225.00	$ 225.00	Engineer's Estimate
Prepare Closeout Report	1	LS	$ 5,000.00	$ -	$ -	$ 5,000.00	$ -	$ -	$ 5,000.00	$ -	$ -	$ 5,000.00	Engineer's Estimate
SITE RESTORATION													
Stone for Road Restoration	150	CY	$ 0.46	$ 0.90	$ 22.11	$ 0.46	$ 0.90	$ 22.11	$ 69.00	$ 135.00	$ 3,316.50	$ 3,520.50	ECHOS Item 17 03 0418
Topsoil, 6" Lifts, Off-site	1900	CY	$ 3.48	$ 3.63	$ 12.35	$ 3.48	$ 3.63	$ 12.35	$ 6,612.00	$ 6,897.00	$ 23,465.00	$ 36,974.00	ECHOS 18 05 0301
Seeding	3	ACRE	$ 64.10	$ 88.11	$ 325.70	$ 64.10	$ 88.11	$ 325.70	$ 192.30	$ 264.33	$ 977.10	$ 1,433.73	ECHOS 18 05 0401
Mulching	3	ACRE	$ 29.32	$ 22.53	$ 1,377.00	$ 29.32	$ 22.53	$ 1,377.00	$ 87.96	$ 67.59	$ 4,131.00	$ 4,286.55	Means Item 02830 2005
Rock Cover, Riprap, Medium	150	CY	$ 3.00	$ 2.38	$ 15.41	$ 3.00	$ 2.38	$ 15.41	$ 450.00	$ 357.00	$ 2,311.50	$ 3,118.50	ECHOS Item 10 05 0203
OVERSIGHT AND REPORTING (Distributive Costs)													
Superintendent	4	WEEK	$ 1,283.00	$ -	$ -	$ 1,283.00	$ -	$ -	$ 5,132.00	$ -	$ -	$ 5,132.00	ECHOS Item 99 01 0102
Project Engineer/QC Engineer (Double Hat)	4	WEEK	$ 839.66	$ -	$ -	$ 839.66	$ -	$ -	$ 3,358.64	$ -	$ -	$ 3,358.64	ECHOS Item 99 01 0104
Clerk	4	WEEK	$ 267.80	$ -	$ -	$ 267.80	$ -	$ -	$ 1,071.20	$ -	$ -	$ 1,071.20	ECHOS Item 99 01 0103
Field Office (and related costs)	2	MONTH	$ -	$ -	$ 1,000.00	$ -	$ -	$ 1,000.00	$ -	$ -	$ 2,000.00	$ 2,000.00	Engineer's Estimate
Per Diem	100	DAY	$ -	$ -	$ 147.00	$ -	$ -	$ 147.00	$ -	$ -	$ 14,700.00	$ 14,700.00	Engineer's Estimate
Continuous Cleanup	4	WEEK	$ 890.00	$ -	$ -	$ 890.00	$ -	$ -	$ 3,560.00	$ -	$ -	$ 3,560.00	Engineer's Estimate
Subtotal									**$ 44,633.12**	**$ 32,246.92**	**$ 286,442.80**	**$ 363,322.84**	
Location Multiplier												81%	ECHOS Localization Factors
Adjusted Cost												**$ 294,291.50**	
Mobilization/Demobilization											10%	$ 29,429.15	
Design											3%	$ 8,828.75	
Overhead											40%	$ 117,716.60	

Worker Protection Level	D
Labor Efficiency	100%
Equipment Efficiency	100%
Material Efficiency	100%

DESCRIPTION	ESTIMATED QUANTITY	UNIT	LABOR UNIT	EQUIP UNIT	MAT'L UNIT	ADJUSTED LABOR UNIT	ADJUSTED EQUIP UNIT	ADJUSTED MAT'L UNIT	LABOR TOTAL	EQUIP UNIT	MAT'L TOTAL	TOTAL	Source
Profit											10%	$ 29,429.15	
Contingency											20%	$ 58,858.30	
Total Alternative Cost												**$ 538,553.45**	

Worker Protection Level	D
Labor Efficiency	100%
Equipment Efficiency	100%
Material Efficiency	100%

DESCRIPTION	ESTIMATED QUANTITY	UNIT	LABOR UNIT	EQUIP UNIT	MAT'L UNIT	ADJUSTED LABOR UNIT	ADJUSTED EQUIP UNIT	ADJUSTED MAT'L UNIT	LABOR TOTAL	EQUIP UNIT	MAT'L TOTAL	TOTAL	Source
SITE PREPARATION													
Deliver/Dump Stone for Haul Roads	200	CY	$ 0.46	$ 0.90	$ 22.11	$ 0.46	$ 0.90	$ 22.11	$ 92.00	$ 180.00	$ 4,422.00	$ 4,694.00	ECHOS Item 17 03 0418
Spread/Compact Gravel Roads	30	CY	$ 1.59	$ 4.55	$ 0.29	$ 1.59	$ 4.55	$ 0.29	$ 47.70	$ 136.50	$ 8.70	$ 192.90	ECHOS Item 17 03 0422
Filter Barrier	2140	LF	$ 1.21	$ -	$ 0.60	$ 1.21	$ -	$ 0.60	$ 2,589.40	$ -	$ 1,284.00	$ 3,873.40	ECHOS Item 18 05 0206
Super Silt Fence	600	LF	$ 1.21	$ -	$ 2.00	$ 1.21	$ -	$ 2.00	$ 726.00	$ -	$ 1,200.00	$ 1,926.00	Engineer's Estimate
Geotextile Non woven 10.oz	10500	SF	$ 0.14	$ -	$ 0.65	$ 0.14	$ -	$ 0.65	$ 1,470.00	$ -	$ 6,825.00	$ 8,295.00	R.S. Means 2340 500 1550
EXCAVATION AND BACKFILL													
4 cy Crawler Mounted Excavator (Direct Load)	45	HR	$ 29.90	$ 237.07	$ -	$ 29.90	$ 237.07	$ -	$ 1,345.50	$ 10,668.15	$ -	$ 12,013.65	ECHOS Item 17 03 0234
Unclassified Fill, 6" Lifts, Offsite (incl. Compaction)	2000	CY	$ 0.86	$ 1.98	$ 5.06	$ 0.86	$ 1.98	$ 5.06	$ 1,720.00	$ 3,960.00	$ 10,120.00	$ 15,800.00	ECHOS Item 17 03 0423
Decontamination (heavy equipment)	4	EA	$ 239.48	$ -	$ -	$ 239.48	$ -	$ -	$ 957.92	$ -	$ -	$ 957.92	ECHOS Item 33 17 0803
WASTE MANAGEMENT/TRANSPORTATION													
Transportation													
Transportation Non-Hazardous Waste by Dump Truck (I	175	HOUR	$ 23.00	$ 45.00	$ -	$ 23.00	$ 45.00	$ -	$ 4,025.00	$ 7,875.00	$ -	$ 11,900.00	Engineer's Estimate
OFF-SITE DISPOSAL (as Non-Hazardous Waste)													
Solid Waste Disposal at Subtitle D Landfill	3200	TON	$ -	$ -	$ -	$ -	$ -	$ 35.00	$ -	$ -	$ 112,000.00	$ 112,000.00	Verbal Quote from SPSA
CONFIRMATION FIELD TESTING													
XRF Instrumentation and Operation	5	DAY	$ 1,000.00	$ -	$ -	$ 1,000.00	$ -	$ -	$ 5,000.00	$ -	$ -	$ 5,000.00	Verbal Quote from SPSA
Operator Travel Costs	1	WEEK	$ 500.00	$ -	$ -	$ 500.00	$ -	$ -	$ 500.00	$ -	$ -	$ 500.00	Verbal Quote from SPSA
DISPOSAL AND CONFIRMATORY TESTING AND ANALYSIS													
Sample Technician	8	HOUR	$ 110.00	$ -	$ -	$ 110.00	$ -	$ -	$ 880.00	$ -	$ -	$ 880.00	ECHOS Item 99 01 06
Soil Sampling Equipment and Supplies	5	DAY	$ -	$ 250.00	$ -	$ -	$ 250.00	$ -	$ -	$ 1,250.00	$ -	$ 1,250.00	Engineer's Estimate
Total Lead, 48-Hour Turnaround (ICP, individual elemer	4	EA	$ -	$ -	$ 35.00	$ -	$ -	$ 35.00	$ -	$ -	$ 140.00	$ 140.00	ECHOS Item 33 02 1705
TAL Metals	20	EA	$ -	$ -	$ 144.00	$ -	$ -	$ 144.00	$ -	$ -	$ 2,880.00	$ 2,880.00	ECHOS Item 33 02 1709
PAHs (SW 846 8270 SIM)	20	EA	$ -	$ -	$ 267.00	$ -	$ -	$ 267.00	$ -	$ -	$ 5,340.00	$ 5,340.00	ECHOS Item 33 02 1715
Full TAL Metals (including cyanide)	5	EA	$ -	$ -	$ 165.00	$ -	$ -	$ 165.00	$ -	$ -	$ 825.00	$ 825.00	ECHOS Item 33 02 1732
TCL Organics	5	EA	$ -	$ -	$ 128.00	$ -	$ -	$ 128.00	$ -	$ -	$ 640.00	$ 640.00	ECHOS Item 33 02 1732
Sample Shipping	2	EA	$ -	$ -	$ 75.00	$ -	$ -	$ 75.00	$ -	$ -	$ 150.00	$ 150.00	Engineer's Estimate
Prepare Closeout Report	1	LS	$ 5,000.00	$ -	$ -	$ 5,000.00	$ -	$ -	$ 5,000.00	$ -	$ -	$ 5,000.00	Engineer's Estimate
SITE RESTORATION													
Stone for Road Restoration	150	CY	$ 0.46	$ 0.90	$ 22.11	$ 0.46	$ 0.90	$ 22.11	$ 69.00	$ 135.00	$ 3,316.50	$ 3,520.50	ECHOS Item 17 03 0418
Topsoil, 6" Lifts, Off-site	1900	CY	$ 3.48	$ 3.63	$ 12.35	$ 3.48	$ 3.63	$ 12.35	$ 6,612.00	$ 6,897.00	$ 23,465.00	$ 36,974.00	ECHOS 18 05 0301
Seeding	3	ACRE	$ 64.10	$ 88.11	$ 325.70	$ 64.10	$ 88.11	$ 325.70	$ 192.30	$ 264.33	$ 977.10	$ 1,433.73	ECHOS 18 05 0401
Mulching	3	ACRE	$ 29.32	$ 22.53	$ 1,377.00	$ 29.32	$ 22.53	$ 1,377.00	$ 87.96	$ 67.59	$ 4,131.00	$ 4,286.55	Means Item 02830 2005
Rock Cover, Riprap, Medium	150	CY	$ 3.00	$ 2.38	$ 15.41	$ 3.00	$ 2.38	$ 15.41	$ 450.00	$ 357.00	$ 2,311.50	$ 3,118.50	ECHOS Item 10 05 0203
OVERSIGHT AND REPORTING (Distributive Costs)													
Superintendent	3	WEEK	$ 1,283.00	$ -	$ -	$ 1,283.00	$ -	$ -	$ 3,849.00	$ -	$ -	$ 3,849.00	ECHOS Item 99 01 0102
Project Engineer/QC Engineer (Double Hat)	3	WEEK	$ 839.66	$ -	$ -	$ 839.66	$ -	$ -	$ 2,518.98	$ -	$ -	$ 2,518.98	ECHOS Item 99 01 0104
Clerk	3	WEEK	$ 267.80	$ -	$ -	$ 267.80	$ -	$ -	$ 803.40	$ -	$ -	$ 803.40	ECHOS Item 99 01 0103
Field Office (and related costs)	2	MONTH	$ -	$ -	$ 1,000.00	$ -	$ -	$ 1,000.00	$ -	$ -	$ 2,000.00	$ 2,000.00	Engineer's Estimate
Per Diem	75	DAY	$ -	$ -	$ 147.00	$ -	$ -	$ 147.00	$ -	$ -	$ 11,025.00	$ 11,025.00	Engineer's Estimate
Continuous Cleanup	3	WEEK	$ 890.00	$ -	$ -	$ 890.00	$ -	$ -	$ 2,670.00	$ -	$ -	$ 2,670.00	Engineer's Estimate
Subtotal									**$ 41,606.16**	**$ 31,790.57**	**$ 193,060.80**	**$ 266,457.53**	
Location Muliplier												81%	ECHOS Localization Factors
Adjusted Cost												**$ 215,830.60**	
Mobilization/Demobilization											10%	$ 21,583.06	
Design											3%	$ 6,474.92	
Overhead											40%	$ 86,332.24	
Profit											10%	$ 21,583.06	
Contingency											20%	$ 43,166.12	
Total Alternative Cost												**$ 394,970.00**	

Worker Protection Level	D
Labor Efficiency	100%
Equipment Efficiency	100%
Material Efficiency	100%

DESCRIPTION	ESTIMATED QUANTITY	UNIT	LABOR UNIT	EQUIP UNIT	MAT'L UNIT	ADJUSTED LABOR UNIT	ADJUSTED EQUIP UNIT	ADJUSTED MAT'L UNIT	LABOR TOTAL	EQUIP UNIT	MAT'L TOTAL	TOTAL	Source
SITE PREPARATION													
Deliver/Dump Stone for Haul Roads	200	CY	$ 0.46	$ 0.90	$ 22.11	$ 0.46	$ 0.90	$ 22.11	$ 92.00	$ 180.00	$ 4,422.00	$ 4,694.00	ECHOS Item 17 03 0418
Spread/Compact Gravel Roads	30	CY	$ 1.59	$ 4.55	$ 0.29	$ 1.59	$ 4.55	$ 0.29	$ 47.70	$ 136.50	$ 8.70	$ 192.90	ECHOS Item 17 03 0422
Filter Barrier	2140	LF	$ 1.21	$ -	$ 0.60	$ 1.21	$ -	$ 0.60	$ 2,589.40	$ -	$ 1,284.00	$ 3,873.40	ECHOS Item 18 05 0206
Super Silt Fence	600	LF	$ 1.21	$ -	$ 2.00	$ 1.21	$ -	$ 2.00	$ 726.00	$ -	$ 1,200.00	$ 1,926.00	Engineer's Estimate
Geotextile Non woven 10.oz	10500	SF	$ 0.14	$ -	$ 0.65	$ 0.14	$ -	$ 0.65	$ 1,470.00	$ -	$ 6,825.00	$ 8,295.00	R.S. Means 2340 500 1550
EXCAVATION AND BACKFILL													
4 cy Crawler Mounted Excavator (Direct Load)	45	HR	$ 29.90	$ 237.07	$ -	$ 29.90	$ 237.07	$ -	$ 1,345.50	$ 10,668.15	$ -	$ 12,013.65	ECHOS Item 17 03 0234
Unclassified Fill, 6" Lifts, Offsite (incl. Compaction)	2000	CY	$ 0.86	$ 1.98	$ 5.06	$ 0.86	$ 1.98	$ 5.06	$ 1,720.00	$ 3,960.00	$ 10,120.00	$ 15,800.00	ECHOS Item 17 03 0423
Decontamination (heavy equipment)	4	EA	$ 239.48	$ -	$ -	$ 239.48	$ -	$ -	$ 957.92	$ -	$ -	$ 957.92	ECHOS Item 33 17 0803
WASTE MANAGEMENT/TRANSPORTATION													
Transportation (of Hazardous Waste)													
Dump Truck Transport, Hazardous Waste (300-399 mi)	6420	MILE	$ -	$ -	$ 2.28	$ -	$ -	$ 2.28	$ -	$ -	$ 14,637.60	$ 14,637.60	ECHOS Item 33 19 0212
Off-Site Disposal (as Hazardous Waste)													
Solid Waste Disposal at Subtitle C Landfill (Requires Stabilization)	600	TON	$ -	$ -	$ 150.00	$ -	$ -	$ 150.00	$ -	$ -	$ 90,000.00	$ 90,000.00	Engineer's Estimate
Transportation (of Nonhazardous Waste													
Transportation of Non-Hazardous Waste by Dump Truck (Local)	135	HOUR	$ 23.00	$ 45.00	$ -	$ 23.00	$ 45.00	$ -	$ 3,105.00	$ 6,075.00	$ -	$ 9,180.00	Engineer's Estimate
Off-Site Disposal (as Nonhazardous Waste													
Solid Waste Disposal at Subtitle D Landfill	2900	TON	$ -	$ -	$ -	$ -	$ -	$ 35.00	$ -	$ -	$ 101,500.00	$ 101,500.00	Verbal Quote from SPSA
CONFIRMATION FIELD TESTING													
XRF Instrumentation and Operation	5	DAY	$ 1,000.00	$ -	$ -	$ 1,000.00	$ -	$ -	$ 5,000.00	$ -	$ -	$ 5,000.00	Verbal Quote from SPSA
Operator Travel Costs	1	WEEK	$ 500.00	$ -	$ -	$ 500.00	$ -	$ -	$ 500.00	$ -	$ -	$ 500.00	Verbal Quote from SPSA
DISPOSAL AND CONFIRMATORY TESTING AND ANALYSIS													
Sample Technician	8	HOUR	$ 110.00	$ -	$ -	$ 110.00	$ -	$ -	$ 880.00	$ -	$ -	$ 880.00	ECHOS Item 99 01 08
Soil Sampling Equipment and Supplies	5	DAY	$ -	$ 250.00	$ -	$ -	$ 250.00	$ -	$ -	$ 1,250.00	$ -	$ 1,250.00	Engineer's Estimate
Total Lead, 48-Hour Turnaround (ICP, individual element 6010B)	4	EA	$ -	$ -	$ 35.00	$ -	$ -	$ 35.00	$ -	$ -	$ 140.00	$ 140.00	ECHOS Item 33 02 1705
TAL Metals	20	EA	$ -	$ -	$ 144.00	$ -	$ -	$ 144.00	$ -	$ -	$ 2,880.00	$ 2,880.00	ECHOS Item 33 02 1709
PAHs (SW 846 8270 SIM)	20	EA	$ -	$ -	$ 267.00	$ -	$ -	$ 267.00	$ -	$ -	$ 5,340.00	$ 5,340.00	ECHOS Item 33 02 1715
Full TAL Metals (including cyanide)	5	EA	$ -	$ -	$ 165.00	$ -	$ -	$ 165.00	$ -	$ -	$ 825.00	$ 825.00	ECHOS Item 33 02 1732
TCL Organics	5	EA	$ -	$ -	$ 128.00	$ -	$ -	$ 128.00	$ -	$ -	$ 640.00	$ 640.00	ECHOS Item 33 02 1732
Sample Shipping	2	EA	$ -	$ -	$ 75.00	$ -	$ -	$ 75.00	$ -	$ -	$ 150.00	$ 150.00	Engineer's Estimate
Prepare Closeout Report	1	LS	$ 5,000.00	$ -	$ -	$ 5,000.00	$ -	$ -	$ 5,000.00	$ -	$ -	$ 5,000.00	Engineer's Estimate
SITE RESTORATION													
Stone for Road Restoration	150	CY	$ 0.46	$ 0.90	$ 22.11	$ 0.46	$ 0.90	$ 22.11	$ 69.00	$ 135.00	$ 3,316.50	$ 3,520.50	ECHOS Item 17 03 0418
Topsoil, 6" Lifts, Off-site	1900	CY	$ 3.48	$ 3.63	$ 12.35	$ 3.48	$ 3.63	$ 12.35	$ 6,612.00	$ 6,897.00	$ 23,465.00	$ 36,974.00	ECHOS 18 05 0301
Seeding	3	ACRE	$ 64.10	$ 88.11	$ 325.70	$ 64.10	$ 88.11	$ 325.70	$ 192.30	$ 264.33	$ 977.10	$ 1,433.73	ECHOS 18 05 0401
Mulching	3	ACRE	$ 29.32	$ 22.53	$ 1,377.00	$ 29.32	$ 22.53	$ 1,377.00	$ 87.96	$ 67.59	$ 4,131.00	$ 4,286.55	Means Item 02830 2005
Rock Cover, Riprap, Medium	150	CY	$ 3.00	$ 2.38	$ 15.41	$ 3.00	$ 2.38	$ 15.41	$ 450.00	$ 357.00	$ 2,311.50	$ 3,118.50	ECHOS Item 10 05 0203
OVERSIGHT AND REPORTING (Distributive Costs													
Superintendent	3	WEEK	$ 1,283.00	$ -	$ -	$ 1,283.00	$ -	$ -	$ 3,849.00	$ -	$ -	$ 3,849.00	ECHOS Item 99 01 0102
Project Engineer/QC Engineer (Double Hat)	3	WEEK	$ 839.66	$ -	$ -	$ 839.66	$ -	$ -	$ 2,518.98	$ -	$ -	$ 2,518.98	ECHOS Item 99 01 0104
Clerk	3	WEEK	$ 267.80	$ -	$ -	$ 267.80	$ -	$ -	$ 803.40	$ -	$ -	$ 803.40	ECHOS Item 99 01 0103
Field Office (and related costs)	2	MONTH	$ -	$ -	$ 1,000.00	$ -	$ -	$ 1,000.00	$ -	$ -	$ 2,000.00	$ 2,000.00	Engineer's Estimate
Per Diem	75	DAY	$ -	$ -	$ 147.00	$ -	$ -	$ 147.00	$ -	$ -	$ 11,025.00	$ 11,025.00	Engineer's Estimate
Continuous Cleanup	3	WEEK	$ 890.00	$ -	$ -	$ 890.00	$ -	$ -	$ 2,670.00	$ -	$ -	$ 2,670.00	Engineer's Estimate
Subtotal									**$ 40,686.16**	**$ 29,990.57**	**$ 287,198.40**	**$ 357,875.13**	
Location Multiplier												81%	ECHOS Localization Factors
Adjusted Cost												**$ 289,678.86**	
Mobilization/Demobilization											10%	$ 28,987.89	
Design											3%	$ 8,696.37	
Overhead											40%	$ 115,951.54	
Profit											10%	$ 28,987.89	
Contingency											20%	$ 57,975.77	
Total Alternative Cost												**$ 530,479.31**	

Appendix C
Volume Estimates

7234f015.dlv 05-SEP-2000

EXCAVATION DEPTH (IN.)	AREA (FT^2)	EXCAVATION VOLUME (YD^3)
2	32,550	200
6	72,750	1,350
10	7,950	250
	TOTAL	1,800

N

0 50 100 150
Scale In Feet

LEGEND

- ● HAND AUGER BORING LOCATION
- ↓ SHOVEL LOCATION USED TO IDENTIFY EXTENT OF GRIT
- ⬭ APPROXIMATE EXTENT OF BARE GROUND/GRIT AT SURFACE
- 6 THICKNESS OF BLAST GRIT OR BLAST GRIT/SOIL MIXTURE (LW08-01 THROUGH LW08-36) (INCHES FROM GROUND SURFACE)
- SG BLAST GRIT AT GROUND SURFACE ONLY
- ND BLAST GRIT NOT DETECTED
- LW08-01-SS-00 SURFACE BLAST GRIT SAMPLE
- 10" DEPTH OF ABM/SOIL TO BE REMOVED
- APPROXIMATE OF EXCAVATION. EXACT LIMITS WILL BE MARKED BY CH2M HILL PRIOR TO INITIATION OF REMOVAL ACTION.

NOTE:

SWMU 8 ORIGINALLY CONTAINED THREE SEPARATE AREAS IN THE SAME VICINITY. SITE INVESTIGATIONS AND TEST DATA HAVE SHOWN THE AREA OF CONCERN TO BE THE LIMITS OF EXCAVATION DEPICTED ON THIS MAP.

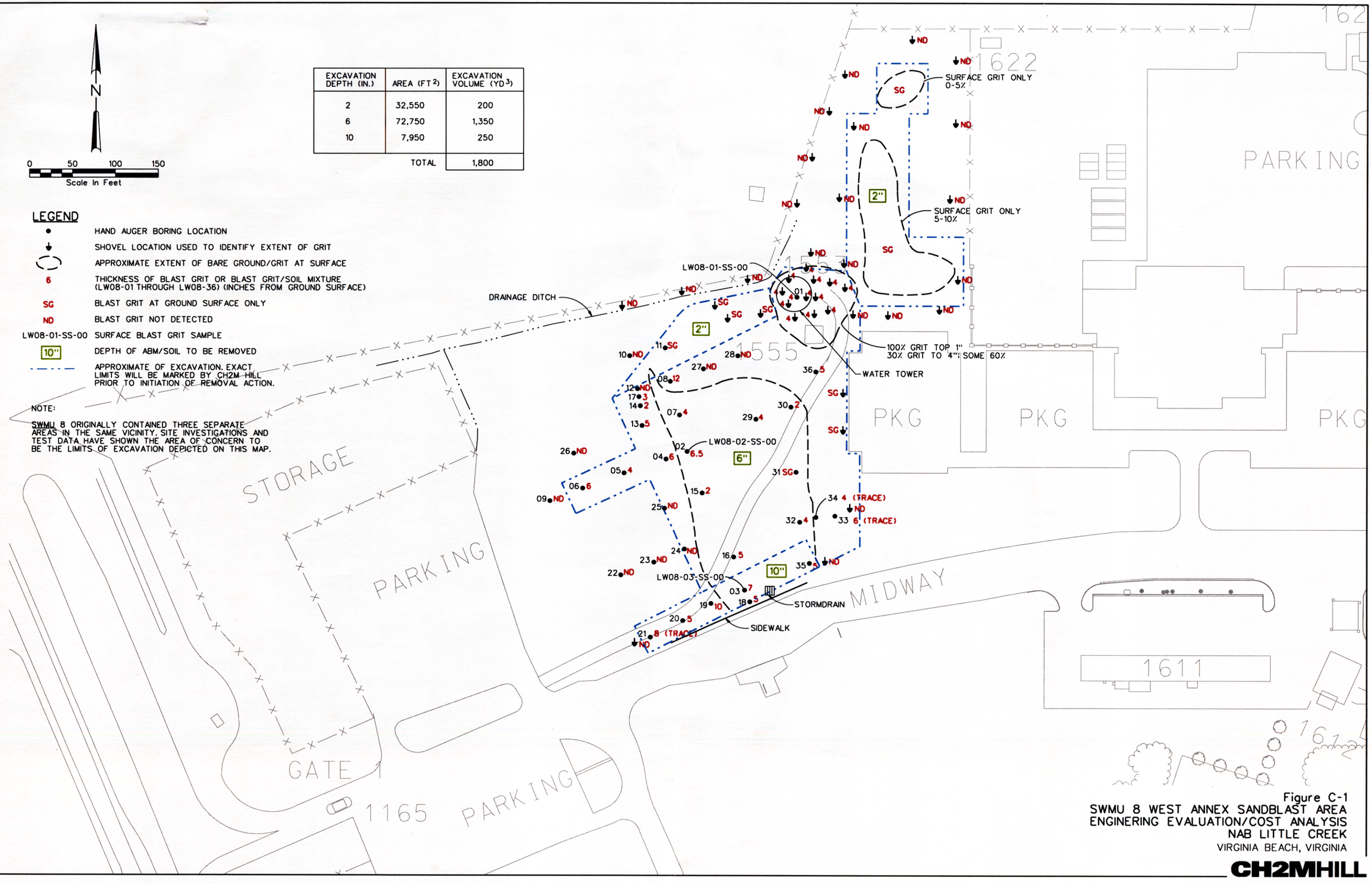


Figure C-1
SWMU 8 WEST ANNEX SANDBLAST AREA
ENGINERING EVALUATION/COST ANALYSIS
NAB LITTLE CREEK
VIRGINIA BEACH, VIRGINIA

CH2MHILL

00415A03Y